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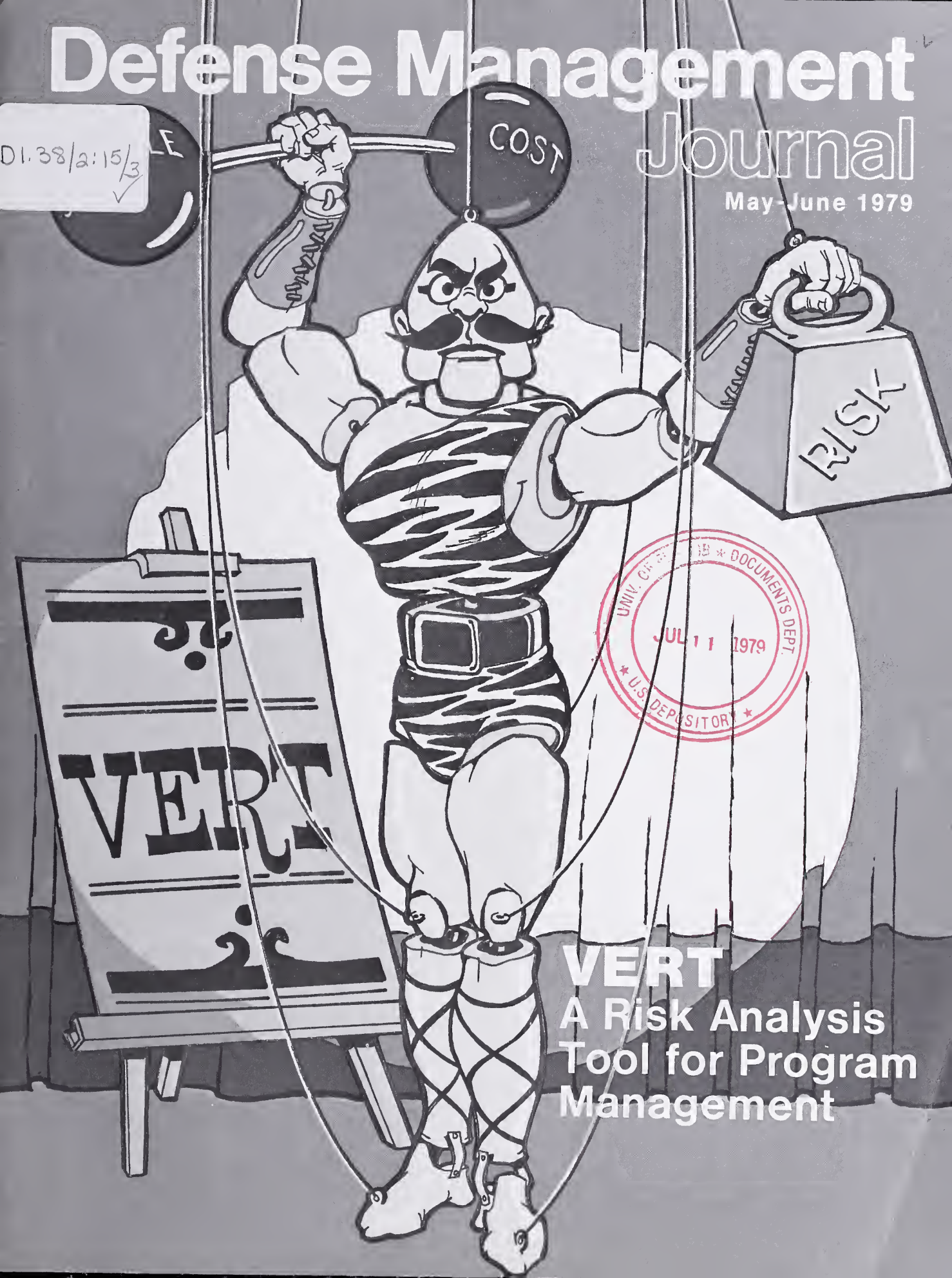

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A Risk Analysis Tool for Program Management

in brief

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Establishing the Army's funding-to-readiness relationship in USAREUR

Maj. Gen. Elton J. Delaune, Jr., Daniel Nussbaum, and C. James Desmartin

Resource constraints and funding shortfalls have swelled a wave of concern about the readiness of the U.S. Army in Europe. Prompted by such concerns, USAREUR officials developed a methodology for quantifying the impact that funding increments and decrements have on USAREUR's readiness posture. Employing advanced decision-analysis techniques and a variety of funding-to-readiness models, the methodology makes it possible for managers to minimize any resulting degradation in readiness and to better articulate resource needs. This article takes a detailed look at this new approach, and describes the funding-to-readiness models that have been tailored for five important elements of force readiness.

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Criteria for training and mobilizing the Ready Reserve

John R. Brinkerhoff and Captain John T. Andrews, USCGR

As the size of the active military force levels off, the Ready Reserve becomes an increasingly important part of the Total Force structure. In time of war or national emergency, members of the Ready Reserve augment active fighting forces and bolster accelerated production and support efforts. Lately, Congress has been emphasizing the importance of that role and the Ready Reserve's ability to transition smoothly from a peacetime to a wartime activity level. Critical to developing and maintaining that capability is reserve training. This article examines the training-category criteria for military occupations and skills, outlines the pertinent aspects of the force-design process, and analyzes the four major phases of mobilization.

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Another side to C^3

Stephen J. Andriole

Communications, command, and control (C^3) has characteristically come to be viewed as the ability to control weapons and to maneuver units by using sophisticated communications technology. But this view is incomplete, overlooking the side of C^3 that encompasses the processing and application of information used in decision making. Now, through the use of recently developed computer-based decision aids, defense managers are finding C^3 information particularly useful in assessing the potential impacts of various U.S. reactions to international crises. Spotlighting this lesser known side of C^3, the author outlines the process for formulating such responses.

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One attempt at managing change

Lt. Col. Keith B. Wolff, USA

Nothing seems quite so constant as change, particularly in today's management environment. As our society becomes increasingly mobile, organizations experience a greater turnover of management and staff. Often the arrival of a new director or manager with a management philosophy different than that of his predecessor can create temporary organizational stress. But any such stress or turbulence can be minimized and even turned to an advantage. Besides, without change, there is little chance of progress or improvement. This article describes how one directorate at the U.S. Army Military Personnel Center actually set out to manage and control the vagaries of change.

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Analyzing and correcting system microelectronics failures

Ed Doyle, Jr.

Today's increasingly diverse and functionally complex systems require a greater degree of specialized support. This is particularly true for electronic systems, which all too often experience semiconductor component failures. The Rome Air Development Center at Griffiss AFB, New York, is DoD's Air Force focal point for reliability and analysis of semiconductor-technology devices. The Center's Quick-Reaction Failure-Analysis System Support Activity provides in-depth failure analysis and device-reliability advice to DoD and Government agencies using or acquiring large and complex electronic systems. This article highlights the growing importance of such a capability and outlines how the Center is handling the upsurge in customer requests.

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DoD's initiatives to strengthen the Ready Reserve

Larry J. Wilson

For several years now, and in particular since the shift to an all-volunteer force, the manpower strength of this nation's reserve forces has steadily declined. More recently, however, there have been signs of this downward spiral leveling off. The turnabout is largely attributable to a number of initiatives instituted by DoD to ensure that this country's Ready Reserve is in a suitable state of preparedness. This article reports on the more significant of those initiatives, including a wide variety of initial training and enlistment options. Also discussed in detail are DoD's attempts at reducing attrition losses through better marketing and more effective leadership.

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VERT: a risk analysis tool for program management

Major Greg A. Mann, USAF

Venture Evaluation and Review Technique (VERT) is a method of risk analysis. VERT is a valuable program management tool that attempts to develop risk-assessment techniques that accurately represent real world conditions. VERT uses a network simulation approach to analyze decision situations in terms of cost, schedule, and performance risk. The technique has supported several development programs, including the Army's XM-1 tank program. Despite some minor problems with the collection of data, VERT shows promise and merits the further research needed to assess the validity of its predictions.

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Sir: Your January, 1979, article entitled "A cost-effective enlistment supply of women for the Army" contains this startling, undocumented statement: "The principal reason for the increase in female attrition is the recent Congressionally mandated cessation of most abortions." This assertion was cleared for release by a number of high Pentagon officials who are supposed to be concerned with factual accuracy and policy directives.

As author of the original restriction on military funding of abortions in the FY 1979 DoD Appropriations bill, I am appalled that such an obvious ideological conclusion, without any statistical basis in fact, could be published in an official Department of Defense journal.

It was only on September 30, 1978, that the DoD began to restrict abortions for military personnel and dependents, as a result of my amendment. Yet, in the article, which was submitted to *Defense Management Journal* by November 15, 1978 (hardly enough time to generate data), this amendment is blamed as the *primary* reason for attrition of females in our Army.

Elsewhere in the article, other conclusions, or supposed statements of "facts," are given a hypothetical or tentative status. However, the unsubstantiated abortion conclusion—viewed as detrimental to female attrition rates—is presented as an unqualified "truth." Now then, since the Army does not conduct exit interviews which ask women if they are leaving because they cannot get a tax-paid abortion, such a conclusion must rest on an ideological premise.

I have discovered that some in the Pentagon view abortion as some kind of "health entitlement." The ancient Hippocratic Oath which once guided medicine viewed abortion as a form of homicide. Furthermore, I fail to see how the male/female fraternization which led to the abortion engenders the necessary discipline which is the sine qua non of military achievement. I was in the Soviet Union during August of 1978 where I had more than a Potemkin Village tour. The troops I saw reminded me of our young men and women during World War II—fresh, energetic and disciplined.

Frankly, the Office of the Secretary of Defense seems replete with officials who share the pro-abortion mind set. How else can one explain that the FY 1980 Department of Defense budget request prepared in October, 1978, was sent to the Congress with the budget recommendation that the abortion prohibition established by Congressional enactment only last September 30, 1978, be deleted? The Health, Education and Welfare budget had the same abortion rider on it, but HEW offi-

CORRECTIONS

There were several unfortunate errors made in the last two issues of the DMJ *that we, the editors, would like to bring clearly to our readers' attention:*

- *In Major Gary Q. Coe's article, "A cost-effective enlistment supply of women for the Army" (p. 31, January 1979), a statement which read, "The principal reason for the increase in female attrition is the recent Congressionally mandated cessation of most abortions," is the author's hypothesis. There is no direct historical data on the effects on female attrition of the Congressional ban on abortion. The ban took effect in FY79. The* DMJ *regrets having misled any reader by this statement or the data reflected in the graph at Figure 1.*
- *The debate between Dr. Jacques S. Gansler and Dr. Seymour Melman (p. 3, March-April 1979) took place at the National Defense University under the sponsorship of the Industrial College of the Armed Forces, not at the National War College as reported.*
- *In Brig. Gen. Winfield S. Scott's article, "Tightening the reins on contract costs and schedules" (March-April 1979), Figure 3 on p. 32 was drafted incorrectly and as a result does not correspond to the text properly. In essence, the figure is a mirror image of the correct graph. We offer a sincere apology to Brig. Gen. Scott and our readers.*

cials did not request the deletion of the identical abortion language.

In response to a critical public comment of mine, I was called by the Surgeon General of the Navy/Marines, who told my staff assistant that he was "neutral" on the abortion question, and that, if anything, he leaned toward my position. However, the *Navy Times* of March 26, 1979, indicated that Vernon McKenzie (Principal Deputy Assistant Secretary for Health Affairs) who told the House Military Appropriations Subcommittee members that the abortion prohibition should be removed "was supported by the surgeon general of each service." This was confirmed by a phone call to a *Navy Times* reporter, Richard Barnard, who was present at the hearing. Formal testimony was also checked. Is that neutrality?

How is it that such a policy prevails when candidate Carter told us that he would get control of the Washington Bureaucracy, and Commander-in-Chief Carter stated at a March 24, 1979, Town Hall meeting held at Elk City, Oklahoma, that "I am not in favor of Government funds, for instance, being spent for abortions. . . . This is a very sensitive issue. It's one that's very divisive."

We in the Congress will shortly be debating the military budget. Members customarily rely upon official information supplied them by the Pentagon. I just wonder, if there were no independent congressional staff inquiries, would this obviously biased policy statement masquerading as a fact have been corrected before congressional debate on the military budget? I doubt it. We in the Congress have the responsibility for establishing policy and appropriating money for the protection of this great nation. And we can't do it unless we have the facts. This situation is not isolated. As a member of the House Select Committee on Narcotics Abuse and Control I am aware that certain Pentagon "command decisions" have left most of the Congress ignorant of the real extent of drug usage in the military.

It might be said this episode is a minor error, or a misstatement of fact which can be overlooked. I say it is outrageous—outrageous because it is an obvious presentation of a biased viewpoint dealing with a very sensitive area not based on fact. For this, there is no excuse, particularly because it calls into question the credibility of the Office of the Secretary of Defense on other important issues, including, but not limited to: the possibility of reinstating the draft, the defense of Western Europe, and detecting violations of SALT II.

Therefore, nothing less than a full retraction of this obviously unwarranted statement is mandated. I know that you will understand the seriousness with which I and many other Members of Congress view this issue and the implications it can have on other matters critical to our national defense that will come before the Congress in the days ahead. It must be corrected or the damage may be difficult to repair.

My background hardly puts me in that small band of Congresspeople who have made the cornerstone of their career an unrelenting, unfair, and vicious attack upon the Pentagon. This is one Congressman who has "gone to bat" for the military time and time again. But I will tell you this, either we as a nation will live by the truth, or we will die by lies.

ROBERT K. DORNAN
Member of Congress,
Fighter Pilot, USAF,
1st Supersonic Wing,
Originator, POW Bracelet,
Member, VFW, Member,
American Security Council,
Member, Air Force Assoc.,
Member, Navy League,
Member, American Legion,
Member, Coalition for
Peace Through Strength

Ed. Note: Please refer to the "Corrections" box.

Sir: Jacques Gansler's article, "The nation effectively achieves its objectives" (March-April 1979), is, in a word, beautiful! It should be required reading for every American adult.

LT. COL. J. P. REILLY, USMC
Quantico, VA

By Maj. Gen. Elton J. Delaune, Jr., Daniel Nussbaum, and C. James Desmartin

Establishing the Army's funding-to-readiness relationship in USAREUR

Advanced decision-analysis techniques and systematically devised readiness models are making it possible for defense managers to determine the impact of funding shortfalls on the readiness posture of the U.S. Army in Europe.

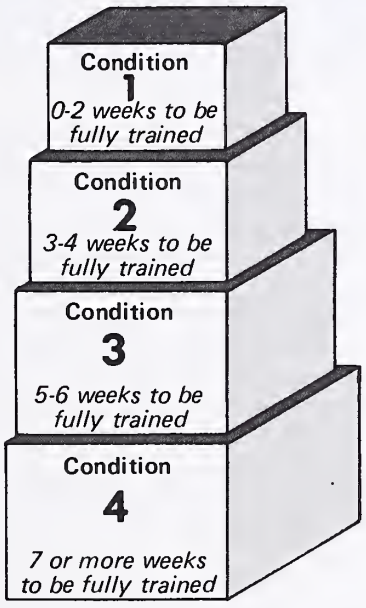
Over the past several years, attempts have been made to quantify the relationship between funding and force readiness. Officials in U.S. Army, Europe (USAREUR), faced with operations and maintenance funding shortfalls, recently brought these efforts to fruition. They developed an approach that incorporates the unit-readiness reporting categories specified in Army Regulation 220-1, "Unit Readiness Reporting," and that conforms with USAREUR's Planning, Programming and Budgeting System.

The USAREUR readiness posture is largely dependent on seven mission-related areas or categories: personnel, logistics, training, life support, operational facilities, weapon systems, and communications, command, and control. The first five of these have been successfully depicted by quantitative models which correlate Operations and Maintenance, Army (OMA) funding to a numerical index. Collectively, the model indices represent an aggregate readiness posture index.

Training model

Any discussion of the five funding-to-readiness category models should begin with training, the category with which the USAREUR commander has the greatest financial flexibility. Of primary interest to USAREUR is field training. A battalion field training day (hereafter referred to simply as "training day") serves as the quantitative unit of measure for field training.

Figure 1. Guidelines for Reporting a Noncombat Unit's Training Readiness Condition



Source: AR 220-1, "Unit Readiness Reporting"

A training day is defined as "Eight to 24 hours of mission-related training conducted by a . . . battalion with sufficient personnel and equipment to accomplish its training task outside its assigned billeting, administrative, and logistics area."

Training requirements and costs differ according to the type of unit (for instance, mechanized infantry versus field artillery) and type of training. The funding requirement for training is determined by multiplying training requirements by costs. Unfortunately, available funds rarely match required funds even for USAREUR's highest priority training program. Thus, when budget constraints limit the scope of training, the training model can help the USAREUR commander analyze and minimize the impact on the readiness of battalions.

In performing such an analysis, it is recognized that the usefulness of training depends on the nature of that training and the type of unit doing the training. The value of each type of training is subjectively determined by battalion commanders, based on their perceptions of the training needed by their units to acquire or sharpen skills. For example, armor battalion commanders may state that one training day in a certain area of training is five times as important as a training day in another area. The relative effectiveness of any one training day is then weighted on a decimal scale of 0 to 1.

Also considered in the training analysis is the formula by which lost training days are converted into readiness-condition impacts. (Guidelines for unit-status reporting as set forth in AR 220-1 are presented in Figure 1.) The extent of the impacts depends on the number of lost training days a unit can endure before a decrement in its readiness occurs. Unfortunately, a uniform threshold value cannot be established since the missions of units differ. Units which regularly perform operational missions similar to their combat mission have a higher threshold and may be able to lose a greater number of training days be-

Figure 2. How Training Shortfalls Impact on Readiness

Crucial changes in a unit's readiness condition occur as the threshold is exceeded by the number of lost training days.

	Training Time Lost per Battalion (in days)	Readiness Condition Threshold (in days)
Mechanized Infantry	9.8	10
Armor	7.2	10
Divisional Cavalry	13.2	13
Nondivisional Cavalry	13.6	13
Field Artillery	8.0	10
Divisional Air Artillery	8.4	10
Nondivisional Air Artillery	3.7	10
Engineer	9.4	7
Signal	4.5	12

fore their reportable readiness condition is degraded. Engineer battalions, for example, may quickly suffer a readiness decrement if they lose training days because they are rarely afforded the opportunity to perform their combat mission except during a field training exercise. Ultimately, threshold values are determined by tempering AR 220-1 guidelines with battalion commanders' judgments.

Another critical factor in assessing the impact of a shortfall in training funds is the apportionment of the effects to the various battalions. The mathematical procedure used to minimize the impact considers the availability of funds, the commanders' assessments of the value of different types of training, and the minimum level of categorical training required for a balanced training program.

At this stage, training data and experiential factors can be combined to convert a funding reduction into a shortfall of training days, which can in turn be assessed in terms of impact on readiness. For example, let's assume that USAREUR's required field-training budget is $90 million and that a budget cut of $6 million is to be evaluated. The effect of the reduction is apportioned on the basis of unit type and unit training. These amounts are divided by the cost of each training day, yielding the number of days that will be lost. The commanders' assessments are then applied and the shortfalls are finally translated into an impact on readiness, as depicted in Figure 2.

In turn, the change in readiness condition is time-phased over the fiscal year. Lost training days are quantified on a monthly basis and are compared to the decremental threshold. When thresholds are exceeded, the change in readiness is recorded for that month. As modeled, the changes in readiness are generally expected to occur in the latter part of the fiscal year, although changes in readiness condition are reported throughout the year whenever a battalion exceeds a threshold.

In the aggregate, this methodology reflects the field training of the average battalion in USAREUR. There is no assurance, however, that a particular battalion's readiness condition will be exactly as modeled, since commander longevity, leadership, personnel turbulence, support, and a host of other intangible factors affect unit readiness. Admittedly, the unique characteristics of individual battalions are obscured by the averaging process. Nonetheless, the aggregate battalion data are extremely useful in justifying field-training requirements at the various command levels.

The five remaining funding-to-readiness models, including the aggregation model, use advanced decision-analysis technology. The technology is computer based and involves model building. Decision-analysis techniques permit the evaluation of several alternatives by organizing a problem into a hierarchical structure that reflects the logical interrelationships of all the factors.

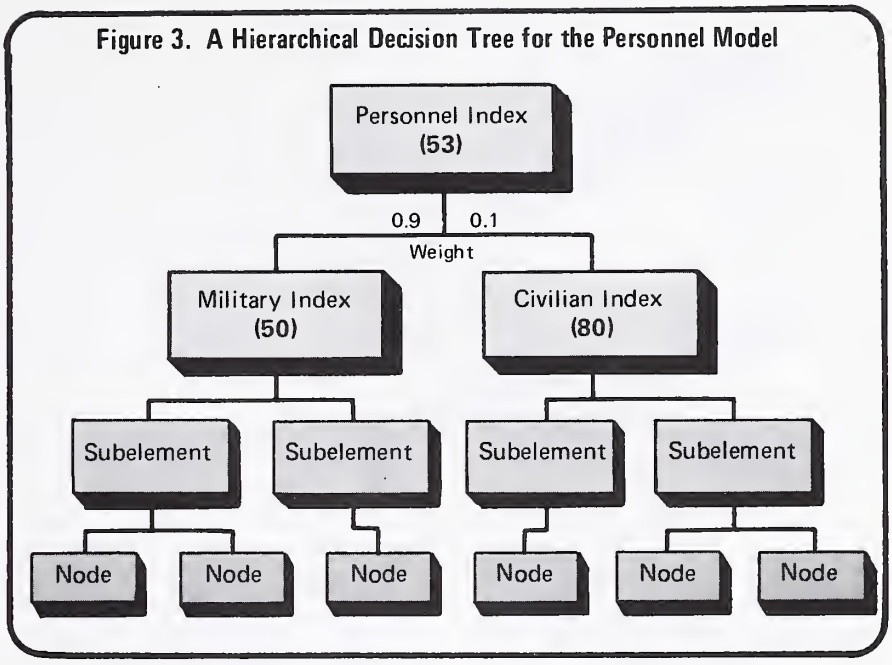
Personnel model

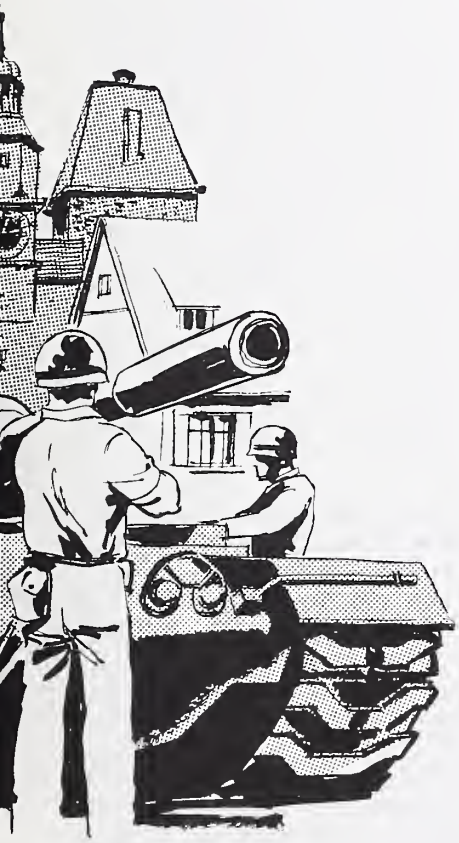
The personnel readiness category represents the largest expenditure of the tax dollar, yet it is the one over which the USAREUR field commander has the least control. The

primary element of this model is military salaries. Civilian salaries are a relatively fixed cost once the fiscal year has begun since severance costs are roughly equivalent to any reduction-in-force savings. As such, in the course of one year the field commander has little actual control over military and civilian salaries. Consequently, personnel readiness as it relates to funding is somewhat inflexible during a fiscal year.

The personnel model is initially structured into a hierarchical decision tree (see Figure 3), which dissects a problem or system into elements and subelements, and so on. The final subelement of a decision tree is called a node. Such a structured hierarchical approach permits a logical and comprehensive examination of every problem, regardless of its complexity.

Figure 3. A Hierarchical Decision Tree for the Personnel Model





Once the decision tree is structured, an index reflecting the relative value of each node is developed. Normally determined by consensus opinion, these valuations are rated on a scale of zero to 100 or are expressed as percentages.

Within a particular model, a common unit of measurement is essential so that aggregation is possible. Typically having little specific meaning, these index numbers instead convey quantified trend information which can be used for comparative analyses. The Dow Jones Industrial Average is a good example of such an index.

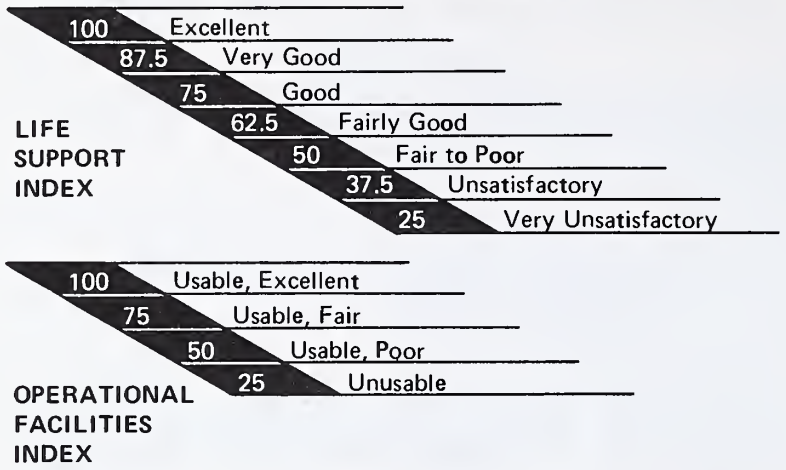
The index used for the nodes of the personnel model represents a percentage of dollars spent in that node as compared to the total dollars spent by the next higher subelement. For example, if 75 percent of the total dollars is spent by node A and 25 percent is spent by node B, the node indices would be 75 and 25, respectively. A similar approach is used in the logistics model, but the life-support model uses opinion and a rating scale. The operational facilities and aggregation models use a combination of approaches. Each approach is explained in greater detail later in this article.

The next step in quantifying a decision-analysis model is the assignment of branch-weighting factors. Weights are based on the importance of each branch to the next higher subelement of the decision tree. Weighting factors and node indices should not be confused. Weightings occur at all hierarchical levels of a decision tree and proportionately represent the worth of each branch, while node indices measure valuations only across the most detailed subelements at the lowest level of a decision tree. Usually, weightings are determined by pooling the knowledge and assessments of many experts. The weighting process conceivably could start at the lowest level of a decision tree with expert technical judgments of node weights, and end at the highest level with branch weightings supplied by policy-level decision makers.

The final decision-analysis step is summarization, which starts with application of the lowest branch weights to the node indices. The resulting values are then adjusted by the branch weights assigned to the next higher subelement of the decision tree, and so on. An exemplary computation of the personnel index illustrates the process.

In Figure 3, the military branch was

Figure 4. Two Nodal Rating Scales



summarized from lower subelements to an index value of 50, while the civilian index was summarized to 80. The respective decision-tree branch weights of 0.9 and 0.1 were then applied to these subelement indices to arrive at a summarized personnel index of 53. Useful as a comparative measure of change, this barometer is initially calibrated in terms of the current level of effort or funds expended in the personnel category. As funding increments or decrements occur, node indices are altered and the model is recomputed. The adjusted, summarized personnel index can then be related directly to the change in funding. This process is called an incremental analysis. A readiness relationship curve for the personnel category can then be defined.

Logistics model

A decision-tree structure is also used in developing the logistics index. Although this model provides an aggregate index of logistics OMA funding, it fails to establish a link to the logistics measurements included in AR 220-1. An extensive analysis of on-hand equipment and equipment status data is currently under way in the hope of identifying this link.

Life-support model

Maintenance of an adequate standard of living is especially essential for a peacetime volunteer force. Unfortunately, minimum standards for life support have not been developed Army-wide. The life-support model therefore relates the impact of funding changes upon USAREUR's current life-support posture.

Life support is divided into nine elements: medical care, recreational services, Army community service, continuing education, postal service, child care, chaplain activities, clubs, and human-resources development. These categories are further splintered into nodes consisting of staffing, facilities, and programs or equipment. Nodal index rating scales are depicted in Figure 4.

These indices were then combined into a USAREUR aggregate by applying branch weightings as determined by USAREUR's Office of the Deputy Chief of Staff for Personnel.

Next, an incremental analysis was performed to measure the impact of funding changes on a scale calibrated in terms of the current index value. For example, assume that the aggregate life-support index was found to be 50 (fair to poor). Further assume that this index is a result of spending $150 million annually for life-support programs. The model would then be calibrated based on how much the index changes as a result of funding increments or decrements. Referring to the example, if $25 million were added to the current funding, one would recompute the model and be able to measure the degree of improvement by ascribing higher ratings to the node indices.

After a sufficient number of funding and index changes are recorded, these paired data are analyzed to determine a generalized relationship between funding and the life-support index. A regression analysis suggests a linear relationship between these paired elements and provides a ready estimate of the

Figure 5. Indices of Aggregate Readiness Postures

By choosing the better alternative in each aggregate-weighted category, a commander can maximize a unit's total readiness posture despite budget limitations.

	Indices		
	Base	Alt. A	Alt. B
Training (30)	100.0	97.2	100.0
Logistics (25)	89.2	89.1	88.5
Personnel (20)	53.0	52.9	52.6
Life Support (10)	50.0	49.4	37.5
Operational Facilities (15)	75.0	74.4	74.3
Communications, Cmd, Control*	0	0	0
Weapon Systems/Equipment*	0	0	0
Readiness Posture Index	79.2	78.1	77.5

*not yet modeled

gross impact that funding increments or decrements have on USAREUR's life-support posture. The regression equation also permits one to portray the general relationship between funding and life support. If a specific assessment is desired, the computerized model can recalculate the life-support index in seconds.

The life-support model has proven extremely useful in quantifying a neglected but important factor in USAREUR's readiness posture. The model now provides input for the aggregate funding-to-readiness model and serves to quantify the subjective evaluations of the status of life support in USAREUR. Additionally, the index values have specific narrative definitions, allowing resource analysts to translate numbers into easily understood terms.

Operational facilities model

The operational facilities model includes all the kinds of facilities needed by USAREUR to perform its peacetime mission. Six primary facility categories were selected for analysis: maintenance, storage, training, utility systems, housing, and administration. A methodology similar to that for the life-support model was employed in developing the operational facilities model. A node rating scale (see Figure 4) was used to quantify the condition of every USAREUR facility. Pertinent data were obtained from USAREUR's automated facility utilization and inventory system, which contains information on facility conditions and performance level.

Data were collected for each facility category based on the geographical region and the particular military community within each region. A facility category summarization was developed by weighting region and community-condition data by subelement and nodular performance. Except for the highest level of the decision tree, the procedure used to weight nodular condition codes depends on performance factors, not on expert assessments as do the other models.

Once the current operational facilities posture was determined, an incremental analysis was performed to calibrate the impact of funding changes on the condition of facilities. Correlation and regression analyses of the resulting paired data suggested the existence of a linear relationship between funding levels and the operational facilities index. Indeed, the model confirmed belief that substantial additional funding is necessary to improve markedly the condition of USAREUR facilities.

Aggregation model

The aggregation model combines each of the funding-to-readiness models into a consolidated USAREUR readiness-posture index. An example of the aggregation model is presented in Figure 5.

The aggregate weightings represent a best estimate of command readiness, but all such taxonomies and weightings are inherently subjective. Advanced decision-analysis technology affords efficient computerized sensitivity testing; as such, it is superfluous to ponder whether training contributes 30 or 40 percent to command readiness if the sensitivity analysis shows that, of the alternatives to be evaluated, the best alternative would not be changed by varying the weight of the category.

The funding-to-readiness models can be used to determine the impact on readiness caused by funding increments, decrements, or redistribution of resources. For instance, suppose that a funding shortfall had been experienced at USAREUR's FY77 midyear budget execution review. Knowing the aggregate readiness index of 79.2, the resource analysts could have then developed several feasible alternatives for decrementing approved programs to absorb the shortfall. Obviously, the evaluation is intended to identify the alternative that minimizes the impact on readiness.

Also assume that only alternatives A and B were available. Alternative A requires all categories, including training, to be decremented. Alternative B does not decrement training, but substantially reduces the life-support index and minimally affects several other indices.

In terms of USAREUR's aggregate readiness posture, alternative A shows less impact on readiness than Alternative B. On the other hand, alternative B illustrates that resource and readiness impacts should be structured to permit USAREUR to execute a balanced program. For example, training was decremented by alternative A, but not by alternative B. Hence, when all categories of peacetime readiness are evaluated, it is often more advantageous to apportion the impact of the decrement to each readiness category.

In summary

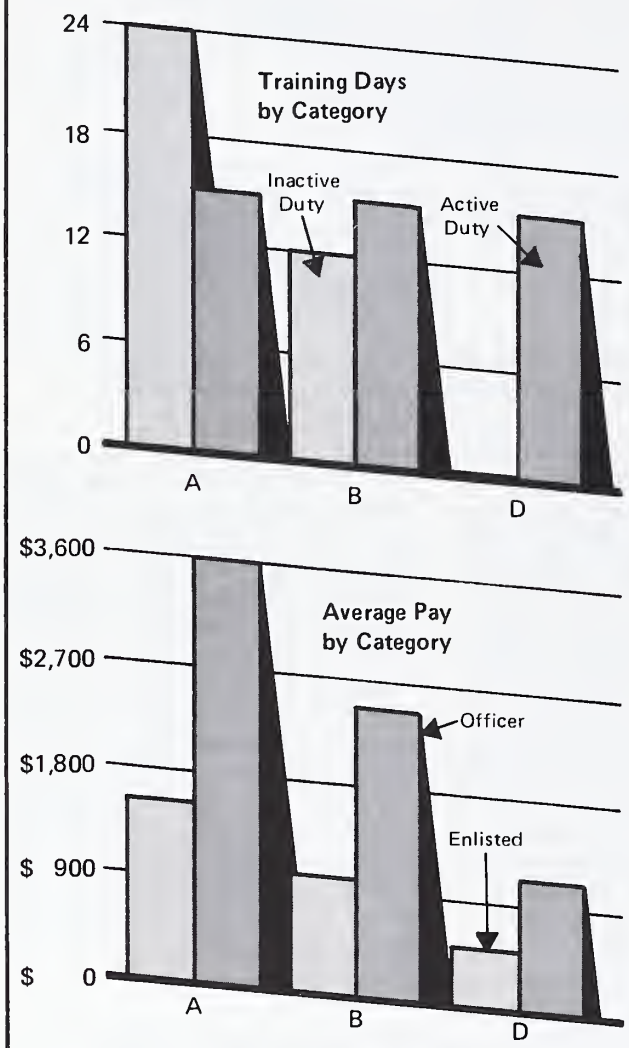
The USAREUR funding-to-readiness models provide a method for summarizing readiness at the major command level. Decision-analysis techniques have provided the means to quantify complex problems in an efficient and logical manner.

Collectively, these models can be used as an analytical tool for resource management and for communicating and quantifying resource requirements to higher headquarters. Additionally, current funding levels can be quantified in a manner consistent with zero-base budgeting precepts. DMJ

MAJOR GENERAL ELTON J. DELAUNE, JR., was the Deputy Chief of Staff for Resource Management, U.S. Army, Europe from May 1977 to November 1978, when the methodology was developed. He has subsequently been reassigned and is currently the Comptroller, USA DARCOM. He holds a master's degree in business administration from Syracuse University.

DR. DANIEL NUSSBAUM and MR. C. JAMES DESMARTIN are operations research analysts in the Economic Analysis and Systems Division of the Office of the Deputy Chief of Staff for Resource Management, U.S. Army, Europe.

Figure 1. Comparative Features of the Major Ready Reserve Training Categories*



*Category H has no drills, training, or pay.

Criteria for training and mobilizing the Ready Reserve

By John R. Brinkerhoff
and
Capt. John T. Andrews, USCGR

The mission and composition of today's Ready Reserve necessitates a detailed blueprint for effectually training and assigning reserve-component personnel.

The Ready Reserve augments the active military forces of the United States in time of war or national emergency. Its members are trained during peacetime to meet a wartime need. The necessary number of Ready Reservists and active-duty personnel—the Total Force requirement—is based on estimates of the military capability needed to meet the threat. Once the Total Force requirement is established, it is necessary to determine the optimal mix of active-duty and Ready Reserve personnel to meet the requirement at the most expedient cost.

After determining how large the Ready Reserve will be, it is necessary to determine what portion of its augmentation to the active forces will be supplied as organized units and what portion as individual personnel. This is crucial in deciding the appropriate training category for each Ready Reserve unit or individual.

Training categories

Each ready reservist is placed in one of thirteen training categories. These categories dictate the amount of inactive-duty training and active-duty training the individual will receive. Pay for each reservist is based on the respective training category. This article will focus on four primary training categories: A, B, D, and H (see Figure 1).

The Ready Reserve is composed of the Selected Reserve and the Individual Ready Reserve. The Selected Reserve

provides units and individuals; the Individual Ready Reserve provides only individuals.

There are two types of Selected Reserve units: operational units, which work or fight as a collective entity; and augmentation units, which supplement the work force of an existing unit. Both perform tasks requiring teamwork and practice.

On the other hand, members of the Individual Ready Reserve have knowledge of a specific skill or job. If a member of the IRR requires refresher training in addition to his active-duty training, he is placed in the Selected Reserve for that training. IRR members who volunteer for annual active-duty training are in Category D; those who do not train are in Category H (see Fig. 2, p. 13).

Training categories and requirements are patterned after the traditions of the militia. Up until World War II, militia units trained periodically during the year and mustered in the summer. This evolved into a system of weekly drills and a summer training stint. After World War II this was formalized into a system of 48 two-hour-a-week drills plus two weeks' active-duty training, the criteria on which today's Category A is based.

The policy of two weeks' annual training for IRR members is of long standing, and it is the basis for Category D training. There is one important distinction between the Selected Reserve training categories and those for the Individual Ready Reserve. Selected reservists, if they are to remain in the Selected Reserve, must perform the pre-

scribed weekly or monthly drills and annual training. However, IRR members (Category D or H) may not be ordered to train involuntarily. Although the law allows all Ready Reservists to be ordered to training, the House Appropriations Committee ordered this practice stopped in the review of the FY 1976 Budget.

As previously mentioned, the Ready Reserve provides either new force capability or augmentation to peacetime capability. The capability that can be provided depends on whether the augmentation is to be in the form of a unit or an individual, and on the training category of that unit or individual. The following are ways in which the Ready Reserve augments the active forces in wartime.

A *Selected Reserve Operational Unit* is a manned and equipped team trained to perform specific tasks in various situations and locations. The unit receives periodic team training throughout the year.

A *Selected Reserve Augmentation Unit* is a team preassigned to augment an existing unit. Its members possess specific skills and job knowledge and have practiced working together. The unit receives periodic refresher training in specific wartime jobs.

A *Selected Reserve Individual Mobilization Augmentee* is an individual preassigned to augment a specific existing unit. Pretrained in a specific skill and job, this individual receives periodic refresher training.

An *Individual Ready Reservist (Category D)* is a person preassigned to augment a specific existing unit or installation and pretrained in a specific skill. He may volunteer to receive annual refresher training in his wartime job.

An *Individual Ready Reservist (Category H)* is a soldier who possesses a specific skill and who will be assigned after mobilization to meet a wartime demand.

Force-structure design

Designing the force structure is the first step in developing a wartime augmentation program. The design of the force structure dictates the number and kinds of units and resources that will have to be provided in wartime. Once these criteria are determined, it is necessary to align the units in the order by which they would be called up if mobilization occurred.

There are two basic types of military units: mobile and fixed. Mobile units move from their peacetime location to other locations during wartime. They deliver a relatively fixed amount of output, and are provided a relatively fixed amount of resources. Examples of mobile units include infantry battalions, tactical fighter squadrons, naval ships, field hospitals, and maintenance companies.

Fixed units, on the other hand, are designed to perform their entire mission at the same location. Their resources are increased or decreased commensurate to the workload. Unlike mobile units, which perform a single function at a fixed output level, fixed units perform several functions at various output levels. Examples of fixed units include air bases, naval operating bases, training centers, motor pools, station hospitals, and maintenance depots.

Augmentation of fixed units

Fixed units must be augmented by additional manpower as workload and resources change from peacetime to wartime levels. In peacetime, a fixed unit's workload depends largely on the amount of resources programmed for it. Its wartime workload, however, is based on wartime requirements and is not affected by peacetime fiscal constraints.

Figure 3 illustrates how the workload increases during the transition from a peacetime to a wartime posture. It facilitates the immediate transition from a peacetime to a wartime activity level. The surge stage is characterized by a great increase in workload in a very short period of time. The surge is manifest in one or more of the following:

- Conversion from a one-shift, five-day-week operation to a two- or three-shift, seven-day-week operation.
- Increased support requirements.
- Generation of full combat capability.
- Need to complete tasks sooner than originally scheduled.

The rapid buildup stage involves the development of new capabilities. It occurs more deliberately than the surge stage, but requires personnel that are trained in individual

skills. Fixed units often will have a need for organized augmentation units to accomplish the rapid buildup.

In the consolidation stage, the added capability and the added workload are balanced and brought into an efficient organizational structure. For example, in the surge stage it is possible to achieve a rapid, temporary buildup by lengthening the work week. This strategy fares well during the early period when adrenalin flows and esprit overcomes fatigue; eventually though, fatigue will set in, and the work schedule will have to be made compatible with the desires and capabilities of the members of the work force. At some point it will become necessary to consolidate by adding the resources needed to accomplish the workload. It is in the consolidation that a balance between workload and resources is attained. It requires individuals trained in individual skills and who possess general job knowledge. They are assigned to a unit after mobilization.

Finally, there is the sustained buildup stage in which workload and resources are added in a balanced and orderly manner to provide a long-term increase in capability. It calls for newly trained individuals who possess general job knowledge. They, too, are assigned to a unit after mobilization.

Training-category criteria

In blueprinting the scenario for Ready Reserve mobilization, one must determine the appropriate training category for a reserve unit. There are two things to consider when deciding whether a Selected Reserve unit is to be placed in Category A or Category B: the unit's scheduled deployment date and the unit's characteristics (difficulty of training, teamwork, content, and size).

A unit's date of deployment or employment after mobilization governs the amount of training time available to the unit. It should be noted that not all of the time between the mobilization day and the deployment date is available for training. Time must be spent getting organized, moving to the mobilization station, receiving people and equipment, and packing for overseas movement. Nonetheless, depending on how well the unit is manned, equipped, and managed in peacetime, a good portion of this time should be available for training.

Training time is limited most for units with early deployment dates. The training time limitation is less of a constraint for units with later deployment dates, and it levels off for units deploying 120 days after mobilization. The adverse impact of decreased training days is difficult to assess since much depends on other factors, including unit characteristics. However, any reduction of 10 percent or more must be judged significant. This occurs about 90 days after mobilization; after that, the rate of reduction is low. Thus, the general rule is that all units with a deployment date within 90 days of mobilization will be in Category A, based on maximum training days; units deploying 90 days or more after mobilization may be placed in Category B.

Figure 2. Relationship of Training Category to Unit Type

Selected Reserve			Individual Ready Reserve
Operational Units	Augmentation Units	Individual Augmentees	
Category A Category B	Category A Category B	Category A Category B	Category D Category H

The difficulty of a unit's training depends on the technical and military content of its mission. Naturally, units with highly technical, complex, and sophisticated equipment require more training than do units with simple equipment. Another factor is the extent to which the unit's mission calls for common civilian skills. Units such as infantry battalions and tactical fighter squadrons have low civilian content, while construction battalions or legal units have high civilian content. Units which are technically complex or have a low civilian content typically have a high degree of training difficulty. The general rule is that units with a high degree of training difficulty will be in Category A, and units with a lower degree may be in Category B.

Teamwork content has to do with the nature of a unit's

Figure 3. Workload Levels at Different Stages of a Fixed Unit's Mobilization

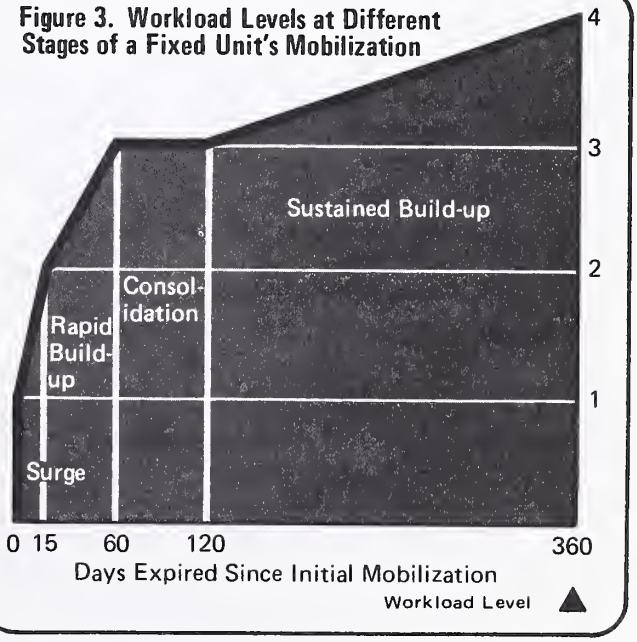


Figure 4. Training-Category Decision Matrix for Selected Reserve Operational Units

Deployment Date	Unit Size	Training Difficulty	Teamwork Content	Category
M Day-M+90	All sizes	High or Low	High or Low	A
M+91-M+120	Battalion	High or Low	High or Low	A
	Company or smaller	Low	High	A
		Low	Low	B
M+121-M+180	Battalion	High or Low	High or Low	A
	Company or smaller	High	High	A
		Low	High	B
		High	Low	B
		Low	Low	unmanned
After M+180	All sizes	High or Low	High or Low	unmanned

operation. If the unit works together as a coherent whole in a complex operation, the teamwork content is high. Teamwork proficiency is a direct result of unit training. The rule here is that military units requiring a high degree of teamwork will be in Category A; those that do not may be in Category B.

The size of the unit is also important. Generally, the larger the unit, the more training it needs before deployment. The difference in size between a company and a battalion, for example, heightens the importance of the extra twelve days of training received by a Category A unit. The goal of peacetime inactive-duty training is the attainment of company-level training. A company-sized unit (100 to 150 people) must be able to function as a team on mobilization day. Training time that becomes available after mobilization should be devoted to improving teamwork. The general rule is that battalions or larger units will be in Category A; companies or smaller units may be in Category B (see Figure 4).

Realities of readiness

Rational planning and programming are necessary preludes to the orderly transition of a Ready Reserve unit from peacetime to wartime output. Rapid augmentation demands that individuals be trained in advance of mobilization and that teamwork be developed.

Category A is preferable to Category B for Selected Reserve operational units. The small saving in cost-per-reserve-unit member does not justify the loss in valuable training time for units deploying in the first three months following mobilization. Units deploying after that time may be placed in Category B if they are small and easy to form and train. In this event, however, it might be better to put that unit into the unmanned component to be formed after mobilization day. The transfer of a Selected Reserve unit from Category A to Category B should be accomplished only after a thorough review of a unit's situation, including its ability to recruit and retain personnel. It should also be kept in mind that the utility of Category D either to provide immediate fillers for operational units or to provide early augmentation for fixed units is greatly limited by DoD's inability to order those personnel to annual training.

It is evident that there is renewed emphasis on the rapid movement of Selected Reserve units to Europe. But such emphasis is plainly incongruous with the conversion of units from Category A to Category B or individuals from Categories A and B to Category D. Clearly, the risks involved in reducing peacetime training overshadow the possible savings such conversions might yield. DMJ

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Another side to C^3

By Stephen J. Andriole

With the help of computer-based decision aids, defense managers are using communications, command, and control information in untangling the implications of prospective U.S. responses to global crises.

Definitions of "communications, command, and control" (C^3) often characterize it as the ability to control weapons and maneuver units via sophisticated communications technology. This perception of C^3 was succinctly addressed in Robert J. Hermann's informative article, "Communications, Command and Control: Changing the Face of Force Management," which appeared in the November 1978 issue of the *Defense Management Journal*. And while this perception encompasses a major and critical aspect of C^3, it does not encompass the full breadth of it. Communications, command, and control also includes the assimilation and analysis of C^3 information for use in decision making.

However, the full utilization of today's sophisticated communications technology is largely dependent on the development of efficient information-processing methods. Thus, if communications technology continues to outpace advances in decision-making and decision-aiding methodology, one can reasonably expect C^3 problems to intensify.

Responding to requests from managers for analytical assistance in defusing sensitive crises, the Department of Defense developed three computer-based decision-making aids.[1] The first of these is designed to help the manager evaluate proposed courses of action. Its data consist of information on 101 crises in which the United States was involved between 1956 and 1976. The decision maker is provided three levels of analytic assistance (see Fig. 1, p. 16).

The second decision-making aid illuminates the management problems that arose during 41 crises in which the U.S. was involved between 1956 and 1976. Included are such things as legal constraints, intelligence failures, and personnel selection.

The third aid enables the user to examine the particulars of 307 crises that occurred between 1946 and 1976. Among the aspects addressed are location of the crisis, degree of threat to U.S. interests, and nuclear implications (see Fig. 2, p. 17).

Development of yet another C^3 decision aid was spawned by Bayesian information-processing methodology. This aid, Options Screening and Intelligence Assessment, combines the probability of an event occurring with the estimated expedience of the various policy alternatives. For example, if the crisis called for a decision on whether to commit troops, one would have to identify and list the factors expected to drive the decision. In deciding whether to deploy troops, the movement of adversary troops would be quite important. If adversary troops began to advance or shift, one might assess a greater need to deploy than if those troops remained stationary. Other relevant factors might include the stability of the adversary government and the likely reactions of third parties. These factors can be incorporated into an influence diagram

[1] *Leo A. Hazlewood and John J. Hayes,* Planning for Problems in Crisis Management, *CACI, Inc., September 1976.*

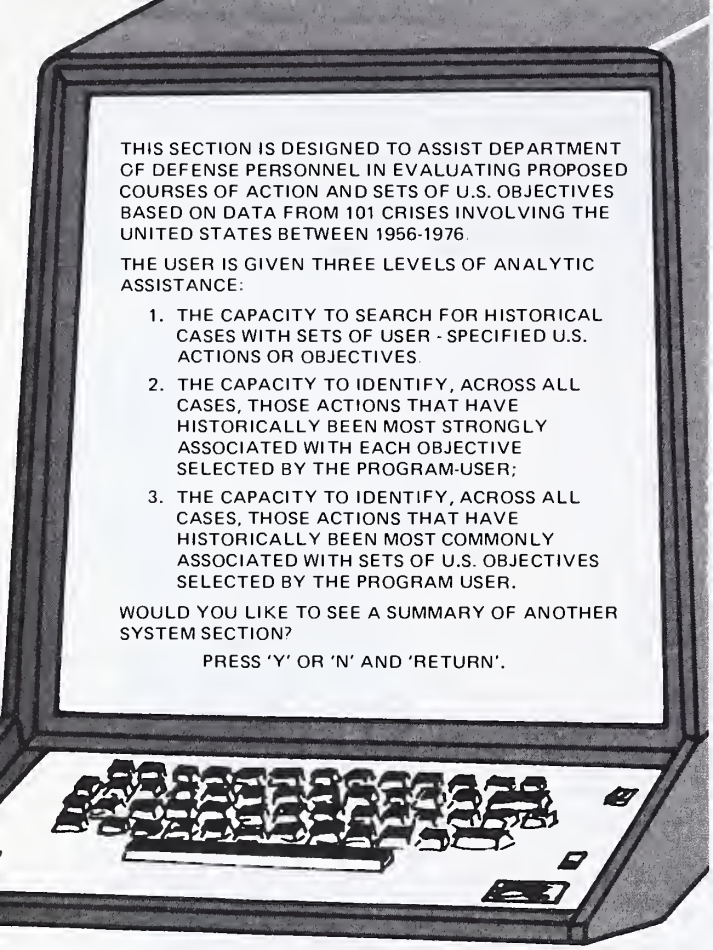

Figure 1. Crisis-Management Decision Aid

depicting how they impact on a crisis. Assessments can be made regarding the likelihood of adversary-troop movement, the likelihood of crisis in the adversary regime, and the likelihood of detrimental, third-party involvement. Numerical probabilities are given to those phenomena and the decision on the deployment of troops can be made.

Much thought is given to the repercussions that a decision to deploy troops might create. The Bayesian methodology helps surface the implications and potential aftereffects of each alternative. This fully computerized procedure also enables one to calculate each alternative's cost and benefits. A discussion of an actual application will highlight the relevance of the methodology.

In 1976 the U.S. faced a situation in the Middle East that generated much concern about the need for a swift evacuation of American nationals from Lebanon. The first task was to determine the probability of an evacuation situation eventuating. As suggested earlier, such a probability is usually dependent on the occurrence of other events, which may be woven into an influence diagram.[2] When the intelligence analysts at the U.S. European Command were asked to list those factors that might drive the necessity for an evacuation, they cited:

- Outcome of forthcoming Lebanese national elections.
- Level of hostilities in Lebanon.
- Possibility of a Syrian invasion of Lebanon.
- Anticipated Israeli reaction to such an invasion.

The analysts proffered four possible outcomes to the evacuation situation:

- Negotiation of a ceasefire agreement, obviating the need to evacuate.
- Continued fighting, leading to the cancellation of commercial flights even though friendly forces control the airport and access routes to the city.
- Increased fighting in the capital, causing most Americans in the city to want to leave and necessitating the dispatch of armed helicopters and security forces to the airport.
- Heavy fighting throughout the country, causing 6,000 Americans and allied representatives to want to leave; evacuation teams must be prepared to operate in a warlike environment.

The probability of occurrence was estimated for each outcome. Based on these estimates, European Command operations and training (J3) analysts listed four evacuation options pertaining to the location and status of the U.S. Sixth Fleet:

- Normal posture, alerting subordinate commanders of a potential evacuation.
- Low profile, with the capability to airlift 500 personnel out of the area.
- Medium profile, with the capability to evacuate 2,000 personnel.
- Full-scale evacuation posture, with the capability to evacuate 6,000 personnel despite a hostile environment.

These options were then linked to the specific value criteria associated with each posture alternative:

- Loss of training in advanced-alert posture.
- Loss of combat readiness while in advanced-deployment posture.
- Threat to the safety of Americans once the decision to evacuate has been made.
- Political implications of either a too-strong or too-weak response to a sensitive situation.

Finally, the intelligence and operations aspects of the problem were combined and the decision alternatives were ranked according to the probabilities associated with the evacuation situation, posture options, and relevant value criteria. Based on the assessed probabilities and value criteria, modified location of the Sixth Fleet was recommended.

The appeal of this C^3 methodology is further enhanced by the availability and portability of minicomputers, which tend to promote dialogue between staff officers attempting to resolve the same or related problems. The computers also make it easy to trace each analyst's thinking through a problem and

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[2] *For a more detailed description of influence diagrams and the use of quantitative subjective probabilities and utilities see J.J. Allen, C.W. Kelly, L.H. Phillips, and R.R. Stewart,* Computer-Assisted Option Screening and Intelligence Assessment, *Designs Inc., October 1976; and R.Y. Brown, A.S. Kahr, and C.R. Peterson,* Decision Analysis for the Manager, *Holt, Rinehart and Winston, 1974; and H. Raiffa,* Decision Analysis: Introductory Lectures on Choices Under Uncertainty, *Addison-Wesley, 1968.*

[3] *See Steven Levin, Antonio Leal, and Joseph Saleh,* An Interactive Computer-Aiding System for Group Decision Making, Perceptronics, Inc., June 1977.

to record the whole process for future study. The Bayesian prescriptive aid is also extremely easy to use. The interactive computer software developed for application purposes prompts analysts and enables them to query the computers and receive immediate responses.

Another prescriptive Bayesian decision aid has been developed to help groups determine the most effective way to approach a complex problem.[3] It calls for members of a group to provide estimates of the probability of the occurrence of specific events as well as estimates of the value and criticality of specific decision outcomes. The decision aid aggregates the input and points out substantive disagreements between group members. It offers the group a precise approach for resolving the disagreements and it identifies those dimensions of the decision which are relatively unimportant to the decision-making goal.

The decision-making group is composed of the participants, an intermediator, and a director. The participants are the actual decision makers; the intermediator and the director are procedural interfaces between the participants and the computer (see Figure 3).

The intermediator formats the participants' requests for input to the decision-aid. Inputs are lists of alternative actions and events, modifications to previously stored information, and commands for the display of selected information. The director is an interface at the other end. He takes the computer's output and presents them to the participants. He also focuses the group's activities and ensures that the group's inputs are appropriate for the decision aid.

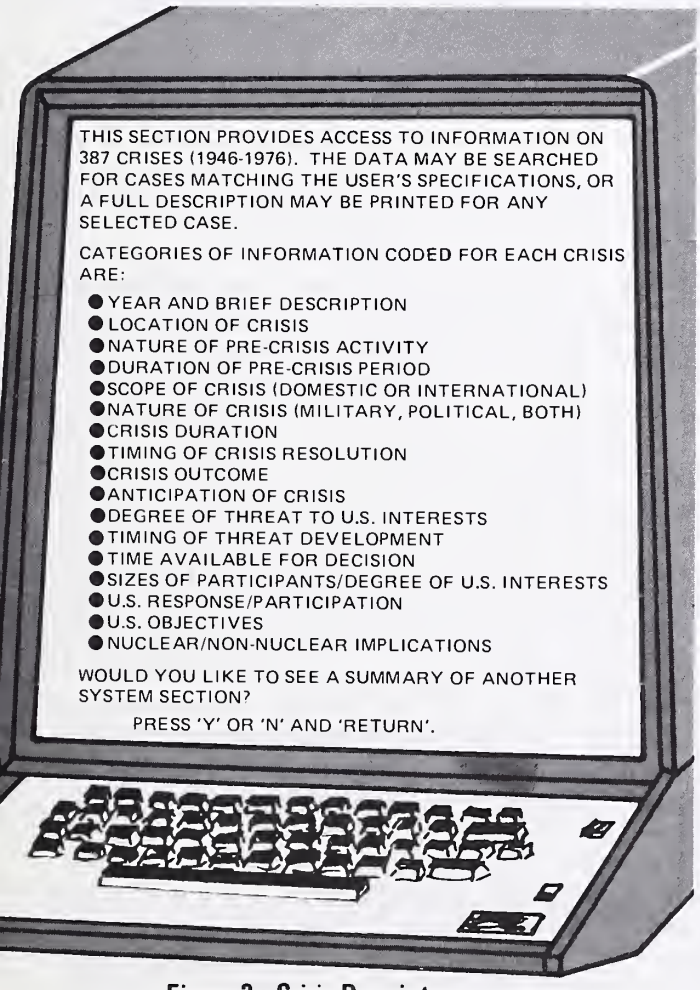
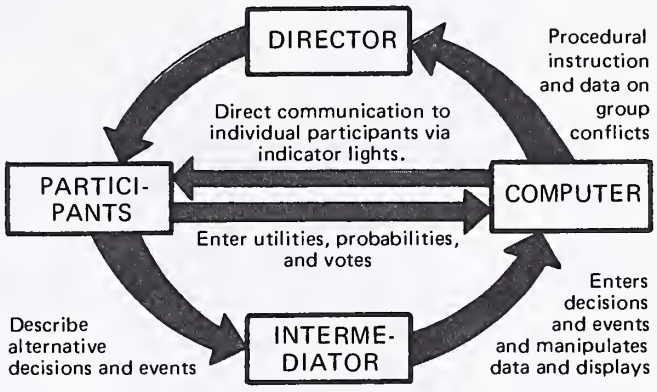


Figure 2. Crisis Descriptor

Figure 3. The Computer-Aided, Group-Decision Process



The Bayesian group-decision aid enables groups to make swift and sound decisions, and it generates data useful for profiling decision makers. From this data, commanders can compile lists of decision makers who have expertise in specific areas. They can also learn which decision makers tend to be risk avoiders or risk takers. After several group decision experiences, a commander usually formulates some definite ideas about which individuals are best suited to solve a particular problem.

Brief mention must also be made of the evolving decision-making methodology involving human factors and display technologies. A number of benefits can be gleaned by using small, desk-top computers with good graphic display capabilities rather than by using large, time-shared systems with no interactive graphics. Easy access to computer assistance will promote the acceptance and use of such aids. Indeed, the interactive graphic displays clearly illustrate that one picture is worth a thousand alphanumeric words.

Decision-making methodology and the human factors and display work so necessary for its successful application constitute perhaps the most important side of C^3 from a performance and impact perspective. While we should continue to devote resources to communications technology, we should not lose sight of the ultimate purpose behind the efficient communication of information and devote adequate resources to the other side of C^3. DMJ

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One attempt at managing change

Organizational change does not have to be the disruptive force that some view it as. In fact, with a little foresight and ingenuity, it can be turned to an advantage.

By Lt. Col. Keith B. Wolff, USA

It's often said that there's nothing so constant as change. Certainly, the unprecedented rate of change in today's management environment is making the struggle for managerial survival more frenzied than ever. Consequently, it is imperative for a manager to be aware of the impact that assorted changes at all organizational levels have on his particular management sphere.

Clearly, there is a need to manage change. The transience and inconstancy of our business environment are manifest in the increasing frequency of organization change. For the most part, the changes stem from the movement of managers from one division or office to another. This is not to suggest that change is undesirable. What is undesirable, though, is failing to recognize change and turn it to the organization's advantage.

Organizational stress often results from frenetic attempts to keep pace with change. Initiatives or measures taken to improve the management of change are actually steps toward reducing organizational stress. What follows in this article is the scenario of how one organization set the wheels of change management in motion.

The Personnel Information Systems Directorate of the U.S, Army Military Personnel Center maintains personnel data on the Army's military and civilian personnel. Managers throughout the Army tap the information maintained by the directorate when filling position vacancies. For instance, if there were a request for an ordnance officer with combat experience and foreign language proficiency, the Personnel Information Systems Directorate would identify the individual or individuals who meet the criteria. The directorate's staff numbers roughly 700 personnel, most of whom are civilian.

Recently, a new manager, Brigadier General John S. Crosby, became director. He wanted

the other top managers of his organization to be aware of and understand his management style and philosophy. He saw a need for clearly defined objectives, and the need to enlist the participation of his top managers in drafting the objectives. Possessing a nontechnical background, the new director also saw a need to tap the expertise of the more technically oriented members of his management team.

Much of the action taken by the director was intended to minimize the disruption created by the migration and turnover of managers. In obtaining technical assistance for the effort, the director selected a third party to serve as a consultant. The consultant was an employee of the director's parent organization, the U.S. Army Military Personnel Center.

Following a discussion in which the director aired concerns about his plugging into the organization, and explained what he hoped to accomplish, the consultant began an assessment of the organization. Before conducting the assessment, the consultant had obtained an agreement from the manager calling for the manager to provide the organization feedback on the issues raised, and to publish any plan of action addressing those issues. The assessment was made via informal individual and group interviews of the employees. Information gleaned from the interviews helped the director determine what areas required his immediate attention. Interviewees were assured of anonymity. Acting on the interview data, which reflected the distribution of the concerns harbored by the members of the organization, the director chose to focus his attention on functional-role ambiguity, task relationships, and direction. Having identified these priorities to the consultant, the director asked for help in developing an approach to mollify these concerns quickly and efficiently and increase organization effectiveness.

"Initiatives or measures taken to improve the management of change are actually steps toward reducing organizational stress."

Based on the interview data, the consultant tailored a meeting design to address the director's specific concerns, namely, harnessing the tremendous potential of the organization's human resources and developing some mechanism for direction and control to make the organization proactive rather than reactive

Keeping pace with change

to the rapid and complex changes which it experiences. Based on the consultant's perceptions which he formulated as a result of the organizational assessment, and in response to the desire to reduce role ambiguity, the meeting design offered an opportunity to clarify the task relationships of the key staff members of the organization. Additionally, the manager expressed a desire for some team-building opportunities for the group. This feature, while more a design subtlety than a distinct phase, was a major objective of the effort. These actions were the preliminaries to the main event—the Long Range Planning Conference.

Recently, the 14 top managers of the Personnel Information Systems Directorate visited the Xerox International Center for Training and Management Development Facility in Leesburg, Virginia. Their visit lasted three days. The visit offered the directorate's top managers the opportunity to develop long-range organization objectives under ideal working conditions. A two-man consultant team accompanied the group. The lead consultant, an Army organizational effectiveness staff officer, was a member of the parent organization, the Military Personnel Center; his assistant was a practitioner in the command's organizational effectiveness program. It was their role to keep the group on track by steering efforts toward the stated objectives.

The meeting began with the opening remarks of the director. He discussed the purpose of the meeting, the composition of the group, and the roles of the consultants. Additionally, the director offered his thoughts on management philosophy and his style of management. In closing, he solicited participation and open, honest communication. Following the short introduction, the consultants led the group through an exercise that identified the hopes and expectations that the participants had for the meeting.

"The transience and inconstancy of our business environment are manifest in the increasing frequency of organization change. For the most part, the changes stem from the movement of managers from one division or office to another."

The next step was developing the agenda. The agenda items, developed by the group, identified the key issues that participants wanted to discuss. The items were then prioritized in the order the group wished to address them.

One of the most interesting and productive phases of the meeting was the discussion of organizational roles. Each participant presented his views on the roles and responsibilities of his fellow managers. Then the participants shared views of their own roles in the organization. These exchanges proved quite rewarding and provided a logical departure point for the next segment of the meeting.

The main event, a discussion on the establishment of the directorate's short- and long-range objectives, followed. Taking many hours, the discussion yielded a set of identifiable, attainable, measurable objectives. It was then decided to discuss a management methodology for measuring the progress being made toward the objectives. As a result, a fine-tuning mechanism, project IMPROVE, was developed to assist management in this regard.

Project IMPROVE featured clear and concise goals that were stated quantitatively as often as possible. Once objectives were set, managers negotiated responsibilities for achieving certain objectives. They then set target dates to report back to the group on their progress toward the objectives. Project IMPROVE differs from other follow-up mechanisms in that most programs feature a contract between the leader and the responsible manager. By contrast, Project IMPROVE expands the information exchange base to include communication between the designated functional managers, directorate-level managers, and staff members.

The planning conference closed with a discussion that focused on ensuring that decisions made at the conference would be carried back to the organization for implementation.

It is important to understand not only what happened, but also how and why it happened. By getting away from the daily work environment, communications patterns were changed. Group members were freed from the trappings attendant to their positions in the hierarchy, and from their traditional work-related roles. The result was increased, open communications between staff members. The meeting design afforded them the opportunity to exchange relevant information and share concerns which probably would have gone unaddressed in the normal communications setting of the work-place.

The director did not surrender his decision-making prerogatives in this process. The gleaning of data from all levels of the organization gave him a much better foundation

on which to base his decisions. Additionally, organizational confidence that the right issues were being addressed by the key staff and confidence that the organization was moving toward the right objectives began to build. In short, there were organizational involvement and ownership.

The design and format of the meeting are not sacrosanct. There can be variations on the theme of managing change. It must be recognized that any such endeavor requires the investment of planning, time, and energy. And while all phases of the design contribute to the success or failure of an attempt at organization improvement, the most critical phase may well be the evaluation and follow-up. This, or any effort like it, must have the organizational involvement and management commitment.

Evaluation and follow-up were institutionalized within the directorate in the decision to hold two- or three-day evaluation sessions every quarter. During the sessions, each member responsible for an area under Project IMPROVE must brief the director and the organization managers on the status of their efforts. General discussion follows, and the top management team negotiates and assigns priorities and resources and offers guidance and suggestions to the responsible manager. At that time, milestones are adjusted or added. Decisions at quarterly reviews are the product of mutual discussion. The director's decisions to allocate resources are never to be unilateral.

There were immediate results from the intensive, two-and-a-half-day, long-range planning meeting. The directorate, at last, had clear-cut objectives that applied across the board. Two middle managers, on their own initiative, presented projects that were accepted for implementation. One of these projects will take the information contained in two voluminous, jargon-ladened manuals and computerize it for simplified, readily available use by MILPERCEN's personnel managers.

Although some results are being felt, perhaps the most important part of the process has yet to happen—that is the integration of a continuous cycle of assessing, planning, implementing, and following up in the daily way of doing business. It is imperative that these steps be used in work environments where the only thing that is constant is change. The approach taken in incorporating this management process must be a systemic one. It cannot be done in isolation. All elements of the organizational environment must be addressed, and all phases in the cycle must be followed.

Planning designs similar to the one outlined above lend themselves to a variety of applications, and are especially helpful to a new organization or an organization in which there are new people in key roles. The very nature of the Personnel Information Systems Directorate, with its constant state-of-the-art changes, creates new challenges for management with increasing frequency. The meeting design allowed the key staff to focus on management's collective and individual roles and objectives. It is hoped that the agreed-upon organization direction will result in energies being spent in pursuit of shared goals.

Certainly, the real work lies ahead for the directorate's key staff. The long-range planning meeting was just the beginning. The broad organizational issues discussed and recorded at the meeting must now be converted into specific actions to meet the objectives. The periodic reviews will contribute to this end.

The frequent changes in the Personnel Information Systems Directorate are far reaching. The rate of change is exponential and interrelated complexities have become the operational norm. Moreover, key staff members find themselves in an environment of shrinking resources. This long-range planning meeting is one attempt to manage change by looking to its people to provide direction. Their role can be even more valuable in the implementation and follow-up efforts. DMJ

"Project IMPROVE differs from other follow-up mechanisms in that most programs feature a contract between the leader and the responsible manager. By contrast, Project IMPROVE expands the information exchange base to include communication between the designated functional managers, directorate-level managers, and staff members."

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Analyzing and correcting system microelectronics failures

By Ed Doyle, Jr.

As semiconductor-device technology becomes increasingly sophisticated, so must the reliability support provided to agencies using or acquiring complex military electronics systems.

The Rome Air Development Center at Griffiss Air Force Base, New York, is the Department of Defense's Air Force reliability focal point for the analysis of semiconductor technology devices under development and for those which have experienced failure during field operation. One particular activity at the Center provides in-depth failure-analysis services to the system product divisions of the Air Force Systems Command, to other Air Force organizations, and to various DoD customers. The activity, known as the Quick-Reaction Failure-Analysis System Support Activity, analyzes how and why a device fails, recommends corrective actions, and monitors system fixes.

This function is essential to any Government agency using complex, military electronic systems. The demand for high-performance military systems has forced designers to incorporate new-device technology, often before its reliability has been fully assessed. On the design table, reliability is sometimes compromised in favor of performance or cost. Naturally, it is desirable to produce and deploy systems that can perform complex electronic functions, but performance is of dubious value if a system's failure rate is too high. When this happens, the cost of field repairs can exceed by far the cost for design, development, and production of the system. Thus, early detection and resolution of component reliability problems can help to avoid unnecessary expenses, thereby reducing the product's life-cycle cost.

Unfortunately, failures occur even when systems are designed using established device technology. These are generally time-, temperature-, and voltage-dependent failures whose likelihood of occurrence cannot be eliminated through testing of production lots. Nonetheless, failure analysis of fielded devices can reduce later repair and retrofit costs, improve the accuracy of projected spares requirements, and generate feedback that may help reduce these device failure modes in future systems.

An organized team of experienced semiconductor-parts specialists is needed to analyze these field failures and devise a cost-effective correction plan. The Rome Air Development Center has such a team, as well as the facilities and corporate memory required to meet the reliability-support needs of DoD's electronic systems.

The Center's capability in semiconductor technology stems from years of operating an in-house experimental fabrication facility for microcircuits, hybrid devices, and specialized test structures for evaluating new electronic materials and processes. Additionally, an extensive failure-analysis laboratory was established to analyze solid-state device failures caused by stress testing and field operations. The Center also provides support in the areas of reliability physics, device applications, electrical specifications, screening standards, and reliability and maintainability engineering support and techniques. Timely and cost-effective system fixes are accomplished by the Quick-Reaction Failure-Analysis System Support Activity, whose contributions result in the improved reliability of ground, airborne, space, and missile electronic equipments used by strategic, tactical, command-and-control, and combat forces.

A system program director, reliability manager, or contractor who is faced with device-reliability problems can ask the device vendor to perform the required analysis and to propose solutions. In choosing this route, however, one must weigh vendor bias. As such, another alternative is to secure an independent laboratory to analyze the problem and recommend corrective action. The Rome Air Development Center acts in this capacity.

Requests for the Center's failure-analysis services are

GOT RELIABILITY TROUBLES?

Could you use some help in identifying and correcting semiconductor-device reliability failures? All you have to do is contact Ed Doyle or one of his staff at:

Quick-Reaction Failure-Analysis System Support Activity
Rome Air Development Center
Griffiss Air Force Base, New York 13441
AUTOVON: 587-2735
Commercial: (315) 330-2735

When you contact the Support Activity, they'll need the following information to help them determine the urgency of your request:

- An identification of the faulty system
- A history of the device's failure
- The number and types of devices to be analyzed
- Whether device specifications and schematics are available
- How to contact the device's vendor and contractor
- Any deadlines for completion of the analysis
- The desired reporting procedures
- Any anticipated travel requirements

treated on an individual basis, taking into account current and projected workloads, system priority or critical need, and the device technology involved. If the decision is made to support a reliability-analysis request, follow-up correspondence is advised, either in the form of a formal letter requesting short-term analysis services or, for long-term efforts, via a memorandum of agreement between the Center and the requesting agency. Any special device-handling procedures and the names of Center personnel assigned to the project are specified at this time. Reimbursement policy requires the customer to bear the direct-support costs incurred on their behalf by an Air Force Systems Command laboratory.

Many failure-analysis efforts have been undertaken by the Quick-Reaction activity. Typical semiconductor-analysis services encompass device-reliability screen-tests fallout, failures occurring during equipment production and testing, and failures occurring during field operation. Since analysis may be done on a single critical device or on more than a hundred representing several types, time requirement may range from a few days to continuous efforts of more than several years. When a large quantity of devices is involved and definitive failure patterns or trends are identified, devices with similar failure modes are grouped and representative failures analyzed. Such support tasks generally require the Center's involvement with government, contractor, and device vendor personnel for an overview and resolution of the reliability problem.

Device-reliability problems recently investigated include lead-continuity failures in plastic encapsulated microcircuits from munitions fuses, electrical-overstress failures generated by aircraft- and ground-test voltage transients, failures due to unattached internal particles in microcircuit packages under zero-G environments in satellite and missile applications, failures related to package internal-moisture levels, and failures related to design, construction, processing, and material incompatibility.

A major factor in the Center's success is its keeping abreast of advances in semiconductor-device technology and reliability as they occur. As technology has advanced from diodes to microprocessor chips, so has the Center's microelectronics expertise. An expanded corporate memory, sophisticated analytical instrumentation, and updated facilities evolved as new failure-analysis techniques were introduced.

Some of the success is also attributable to the Rome Air Development Center's far-sighted management decision to focus reliability research and development pro-

A scanning electron microscope (electron-beam instrumentation) has been useful in resolving lead-wire corrosion problems surfacing in the Short-Range Attack Missile microcircuitry.

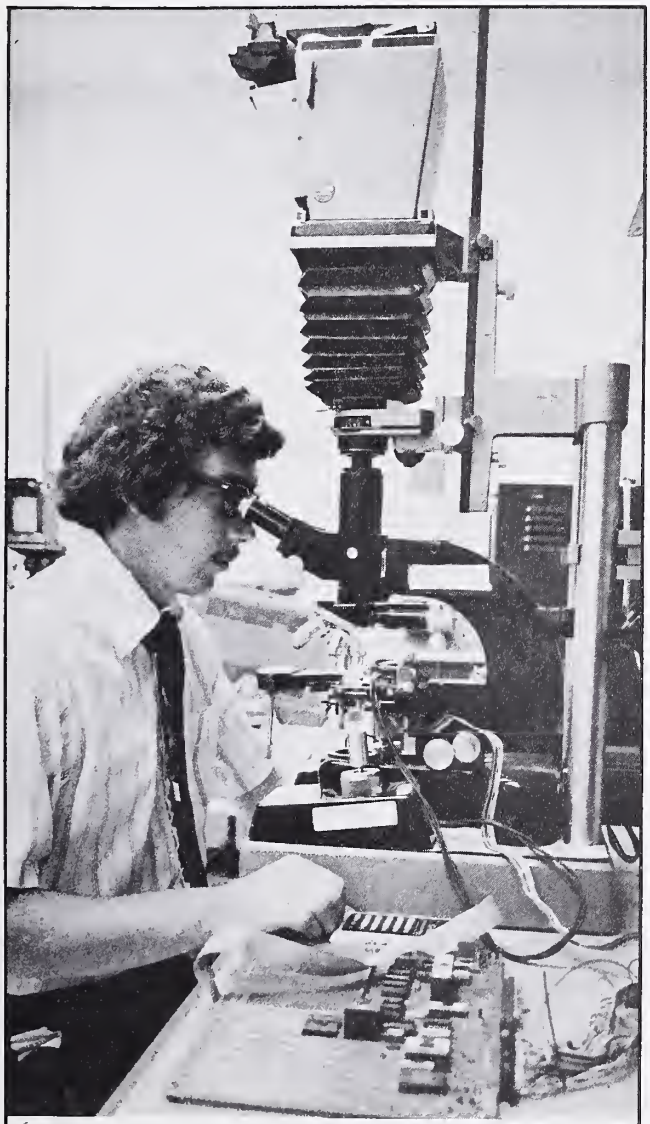
grams on semiconductor technology. Nevertheless, some of the Center's work has also been aimed at improving the reliability of passive devices (nonsemiconductor components and electromechanical parts), since these elements are used in a variety of military systems. Here the emphasis is on critical system components with specific reliability problems.

Crucial to the effective management of a research-and-development organization, while making available unique technical services such as failure analysis, is the imposition of support decision criteria. The Center, in maintaining its technology-intensive research and development programs and in providing reliability expertise for Air Force systems, bases request decisions on a need-and-benefit trade-off. Other DoD, government agency, and industry requests for reliability support are assessed in light of commitments to Air Force programs. While system acquisition agencies need solutions to operational system-device reliability problems, the Center gives highest priority to those problems associated with state-of-the art semiconductor technology. In all cases, the Center invites inquiries and the opportunity to assess support requirements under the Center's System Support Activity charter and within its capability. Once the Center agrees to provide system support, the failure-analysis activity manager must:

- Determine the requirements for manpower, travel funds, supplies, and equipment.
- Assign appropriate personnel to the relevant technical analysis areas.
- Establish definite schedules and completion dates for analyses and technical reporting.
- Estimate additional time that may be required for follow-up actions and briefings.
- Adjust job schedules to meet existing workload and system priorities.
- Ensure workload flexibility so that unanticipated, high-priority, system-support requests can be handled.
- Communicate with people at all levels of authority.

Critical to attaining improved device reliability is corrective-action feedback to the part vendor. Data gleaned through device test and analysis are used for solving specific part problems. Corrective actions, based on test-and-analysis findings, may take the form of a design, material, process, or test change; occasionally, they may be in the form of circuit application modifications. Of course, corrective actions are often governed by cost, schedule, performance, and configuration constraints. In effect, each reliability fix must be assessed individually, with consideration given to all system requirements and corrective-action alternatives.

The Quick-Reaction Failure-Analysis System Support Activity is a progressive, well-managed, responsive organization. Its services ultimately result in more reliable electronic defense systems, thereby contributing to this nation's deterrent-defense posture. DMJ



Applying nematic liquid crystal techniques, a member of the Quick-Reaction Failure-Analysis Team examines the microcircuitry of the F-16 flight-control computer.

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By Larry J. Wilson, *DMJ* Editor

DoD's initiatives to strengthen the Ready Reserve

Responding to Congressional requests for assurance that this nation's Ready Reserve will be fully manned and prepared in the event of a mobilization, the Department of Defense has established a comprehensive program to improve the total readiness of the Reserve and National Guard in fiscal year 1980. The objectives of this program, as delineated in Congressional testimony, are fourfold: to increase Selected Reserve strength, to ensure a sufficient supply of pretrained individual manpower, to bolster training, and to improve the deployment capability of reserve forces.

That such a broad program should be deemed necessary merely reflects what many Defense managers felt was an inevitable occurrence: as the United States changed from a country fighting a war with drafted soldiers to one at peace defended by a completely voluntary active-duty force, the inclination of young men and women to join the reserve forces would steadily decrease.

The statistics bear this out. Since the beginning of the All-Volunteer Force, the Army Reserve has dropped from nearly 235,000 to 188,900 personnel, with better than 43,000 of the losses in the enlisted ranks. Similarly, the Army National Guard fell from an end strength in FY74 of 411,000 to 347,600 in FY78. Overall, the Army is nearly 130,000 enlisted personnel short of its peacetime objective for the Selected Reserve, and several hundred thousand under strength in the Individual Ready Reserve.

On the other hand, the Air Force last year achieved a 15-year high in Selected Reserve manning while actually reducing by 20 percent the size of the headquarters staff in the recruiting directorate. The Air Force exceeded its end strength goal by, among other things, drawing heavily on advertising leads, increasing the number of new recruiters, using specialized publications to reach target audiences, and counseling nearly 20,000 people who were finishing their active-duty tours. As proof of their success, in FY78 the Air Force Reserve recovered over $70 million in sunk costs by recruiting prior-service personnel who had already been trained while on active duty. Thus, their recruiting service recovered its budget almost every month last year.

Moreover, there are signs that the downward spiral in Army reserve components is leveling off.

Although the Army Reserve and Guard suffered a net loss of some 26,000 ready reservists in FY78, thus far in FY79 there has been a gain of more than 5,000 in enlisted end strength, with particularly encouraging growth occurring in the first quarter of this calendar year (see Fig. 1, p. 28).

This turnabout is due in large part to a number of the initiatives instituted by DoD to ensure that this country's Ready Reserve is in a suitable state of preparedness. These initiatives were in fact the major topic of conversation in Denver, Colorado, this past spring, when representatives from each of the services' reserve components met at the Defense Department's Second Joint Reserve Forces Conference on Recruiting Accession and Retention.

At the conference each service reviewed its components' progress and problems in meeting the aforementioned objectives, and representatives of the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) frankly discussed other initiatives presently under consideration. The sometimes heated discussions covered a broad range of initial training options, various combinations of enlistment options, and the need to pay greater attention to attrition losses.

Representatives from each of the services' reserve components gathered last March in Denver for the Second Joint Reserve Conference on Recruiting Accession and Retention to discuss proposals for achieving a fully manned reserve force.

One of the more noteworthy prerogatives that was considered at the conference and that is being accorded the reserves today is increased flexibility in offering enlistment alternatives to prospective candidates. In the past the standard enlistment option for the Selected Reserve has been six years. This is a long time, and marketing researchers believe that a shorter initial enlistment period will attract more recruits. The Army and Marine Corps have been authorized for the past few years to obtain up to 20 percent of their non-prior-service enlistments for an initial period of four years. This is called a 0x4x2 enlistment option (no years active, four years Selected Reserve, and two years in the Individual Ready Reserve). Women in the Army and Marine Corps have been allowed the 0x3x3 enlistment option (no years active, three years Selected Reserve, and three years IRR). Moreover, in an effort to increase the attractiveness of Selected Reserve membership, the Army has just been authorized to offer the 0x3x3 enlistment option to men in all units of the Army Guard and Reserve.

The Army is also testing some other enlistment options which will provide some additional personnel for the reserves, although indirectly. For example, the Army is testing a two-year, active-duty enlistment option in which the remainder of the six-year military service obligation would be spent in the Ready Reserve. A variation of this option specifies that the four years of service remaining after the initial two years of active duty would be spent in the Selected Reserve. Both of these options will add to the strength of the Army Reserve Components in two years. Additionally, the Army is testing a direct enlistment option of six years in the IRR. Under this scheme the individual can receive his or her initial active-duty training of three or four months and then serve the remaining time in the IRR, with some refresher training at two-year intervals thereafter.

In addition to the various enlistment options, there is also a split training option and a militia careers program. Under the former, enlistees may take basic training and advanced individual training at different times; thus, a college student unable to get away for 12 weeks or more at a time could split his or her training into successive summers. Under the latter option, a young person could join a Guard or Reserve unit in his senior year of vocational high school; the student takes his skill training at the high school and takes basic training immediately after graduation. This option

is being tested to determine its effectiveness in attracting high-quality, technically skilled personnel.

A similarly diverse set of alternatives is currently available with regard to enlistment and reenlistment bonuses and educational assistance.

The Army incentives are based on a strategy of first bringing up to strength those units scheduled for early employment in a major contingency. The Army programs limit enlistment and reenlistment bonuses to these early-deploying or -employing units at this time. As the early units get up to strength, the focus and the bonuses will be authorized for later-deploying units. However, in an attempt to give a general boost to strength, the Army announced an open season of March 15–June 15 when bonuses would be available to all Army enlistees. At the end of this open season, the program reverted to its former mode.

For the other reserve components the bonus program is designed to attract people with certain critical skills. People with these skills entering a reserve component in need of such talent can receive an enlistment bonus of $1,500 of which half is paid upon completion of initial basic and skill training and the rest as incremental supplements at later stages of the enlistment. The bonus is available for non-prior-service enlistees who are high school graduates and are rated in Mental Category III or higher. Alternatively, as much as $2,000 in educational assistance is available to selected people who enlist in the reserves. Those people who reenlist can earn a bonus of $1,800 over the course of a six-year period.

In return, incentive participants must agree to serve satisfactorily in the Selected Reserve for the full term of their enlistment or reenlistment. Unless they are excused for the government's convenience, they must also serve their term in the same component and bonus-qualified military occupational specialty. If, for example, an individual later accepted a civilian position requiring reserve membership, the bonus entitlement would cease. The educational assistance can be terminated for many of the same reasons, or if the candidate graduates, drops out of school, or completes six years of service.

But there are a few quirks in the system as well. The Army and Marine Corps, for instance, use a more simplified set of qualifying factors than do the Air Force and Navy. Moreover, there seem to be some inconsistencies in the logic applied to repayment of misused incentives. As Colonel Edith Hinton of the Army National Guard noted, reservists who lose their bonus entitlement pay back only the unearned portion, while those who fail to retain their right to educational assistance must pay back all that they have already earned as well. On the other hand, those who receive the enlistment bonus and subsequently enroll in officer candidate school must pay back $450 of the bonus, yet recipients of educational assistance are burdened with no such restriction.

The Defense Department has asked Congress to eliminate these inconsistencies for the sake of fairness. DoD has also asked for approval to reprogram some of the $24.5 million FY79 bonus money from enlistment to reenlistment incentives, since the Navy and Air Force are technically oriented and prefer previously trained personnel.

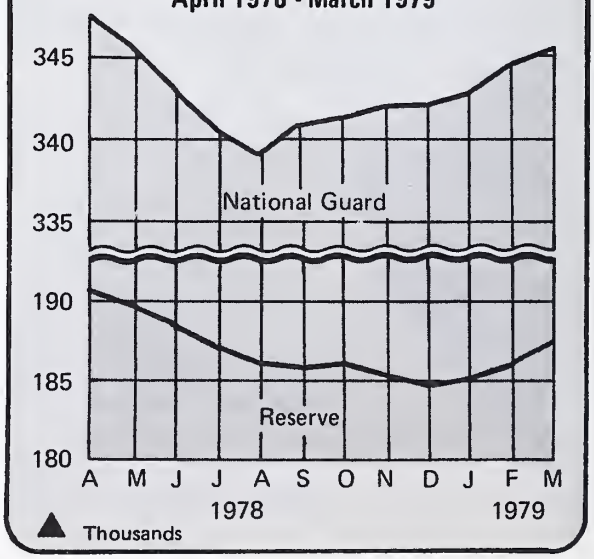
Other initiatives

Less ostentatious than the bonuses but no less significant are DoD's initiatives to promote the product better through improved advertising and a full-time professional recruiting force of about 5,000 people.

In addition, all recruiting functions for the Army Reserve are now centrally managed by the U.S. Army Recruitment and Enlistment Command. USAREC can provide several advantages:

- A centralized referral program for following up on advertising leads and on referrals emanating from unit commanders.

Figure 1. Strength Trends of the Army Selected Reserve, April 1978 - March 1979



• An automated system for reporting reserve accessions.

• Access to Military Enlistment Processing Command entrance and examination stations on the weekend.

On a smaller scale, a number of management improvements have bolstered recruitment opportunities. The Air Force is increasing its efforts to recognize effective recruitment by, among other methods, commissioning its top recruiters through a new Deserving Airman Program. Several dozen noncommissioned officers assigned to nonrecruitment duties at Veterans Administration hospitals are now responsible for providing USAREC with reserve referrals. At 31 installation transfer points worldwide, about 60 recruiters have been signing up about 1,000 new reservists each month, and the potential for even greater success in this program is very high. Further, the Navy has created a Gold Wreath Award to honor its outstanding recruiters, realizing that not every command has the authority to bestow medals on its deserving personnel.

Additionally, a National Committee for Employer Support of the Guard and Reserve is attacking the problem of reserve retention at the grass-roots level. The idea here is to obtain the names and addresses of all National Guard and Reserve employers, and contact those who have not signed a statement of support. By conducting market-analysis research to determine employers' and employees' preceptions of this program, the Committee hopes to use its advertising more effectively and thereby meet everyone's needs better. Finally, the committee has designated September as Employer Appreciation Month in order to thank employers supportive of the Guard and Reserve, to remind them of the continuing need for their cooperation, and to increase public understanding of the crucial need for the Ready Reserve.

> **"We have initiated a program to improve the overall product, the pay, and the promotions. The result has been a bottoming out in reserve manpower and we have started a climb back toward total authorized strength."**
>
> *– John R. Brinkerhoff, Acting Deputy Assistant Secretary of Defense (Reserve Affairs)*

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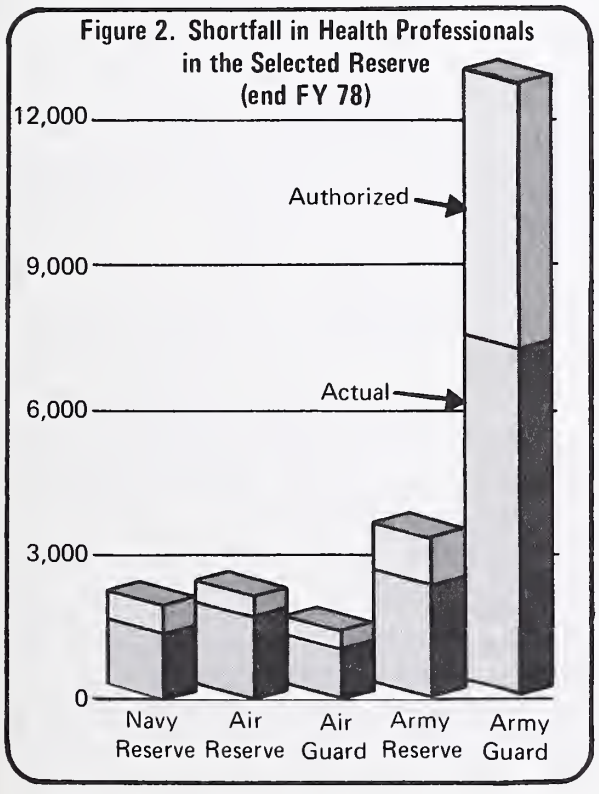


Attrition and other problems

Generally, the services are doing a good job of attracting new recruits, but they are not doing as well in retention. Across service lines, only about a third of new recruits complete their initial six-year obligation. The Army Reserve seems to be having the most difficulty: in FY78, 55.2 percent of losses were unprogrammed, and the projected figure for FY79 is an even more alarming 58.4 percent. Total Army reenlistments and extensions fell below the FY78 U.S. Forces Command objective of 65 percent, and fell 8.7 percent below the crucial break-even point.

While some of this attrition is due to people leaving the reserves for active duty, most is due to

people leaving the service entirely. This problem is undergoing intense scrutiny in DoD. Meanwhile, the Department is tightening its discharge standards and is designing training options to increase the likelihood of success during initial training. Incentives are also being designed to improve retention. Top management in DoD recognizes that the key to retention is interesting, effective training and sound leadership, and during the next year they will be directing extensive attention to the role of these factors in reducing attrition.

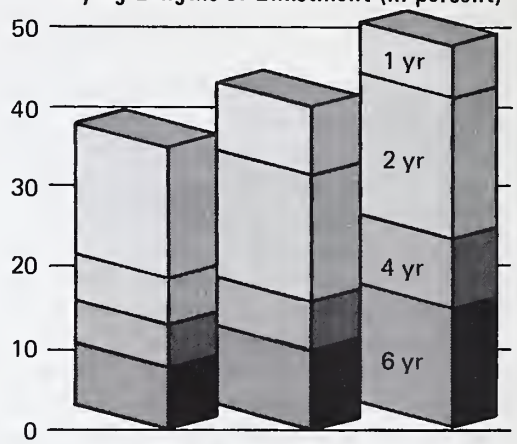
Next to the Army, the Navy has experienced the most serious shortfall in strength over the past several years. Its most immediate problem is in coming up to strength with regard to middle-level enlisted personnel and lower-level officers; for example, the onboard strength of officers at the lieutenant (junior grade) level is one-fourth of the precentage allowed for that grade. Nevertheless, an even greater challenge over the long term involves achieving an optimal mix of experienced officers and enlisted personnel. Whereas 36 percent of reserve sailors have less than 6 years' experience, only 3 percent of the Navy Reserve officers have less than that amount of experience, and fewer than a third have less than 10 years' experience. This mismatch seems to portend ill for the next decade of the Navy Reserve.

But perhaps the most glaring strength deficiency is that of health-care professionals, who as a group generally do not preceive any incentives to serve in the reserve components. At the end of FY78, the reserves were nearly 8,000 officers below authorization; of that total, the Army experienced a shortfall of more than 6,600 (see Fig. 2, p. 29). Given the likelihood that this decline will continue unless action is shortly forthcoming, DoD has begun or has under consideration a number of initiatives, including:

- Simplified procedures for processing applications.
- Initial appointment in the grade of captain rather than first lieutenant.
- Elimination of some of the mandatory military educational requirements needed for promotion.
- Emphasis on continuing medical education in lieu of routine training for some personnel.
- Permission to retain medical officers until age 64.

The Defense Department also hopes to promote the attractiveness of the reserves to medical personnel by broadening loan-repayment opportunities and by acquiring better training equipment.

Figure 3. Positive Propensity to Enlist at Varying Lengths of Enlistment (in percent)



Pretrained manpower

Although there is not a shortage of pretrained personnel, there is a major management problem in ensuring that the assets needed in the event of mobilization are available at the right time and in the right place. This is primarily due to the low strength of the Individual Ready Reserve, the preferred source of pretrained individuals.

DoD is concentrating its short-term supply strategy on utilizing all sources of pretrained manpower, including existing IRR personnel, retired personnel, standby reservists, and just enough veterans to meet the inventory objectives. The long-range strategy is to build up the strength of the IRR so that by the mid-1980s it can meet the demand for pretrained individuals.

To do so, DoD has implemented numerous actions, including:

- Eliminating transfers to the standby reserve by individuals who have not completed their 6-year obligation.
- Transferring to the IRR those people who are being considered for discharge before completion of their obligation, if they can meet mobilization requirements.

DoD will also change the policy that permits individuals entering the service via the Delayed Entry Program to count the time spent in that program toward fulfillment of their obligation. This action alone is expected to increase the Army's Individual Ready Reserve by about 50,000 man-years. In addition, in April 1979 the Army began a test of direct enlistment into the IRR. If this pro-

gram succeeds, it could provide the required pretrained manpower that cannot be obtained through other programs.

Marketing and the audience

Obviously, there are no magical solutions to the problems faced by the Ready Reserve. Correcting the situation calls for dedicated leadership and improved management practices.

With this in mind, DoD is conducting a number of studies and primary research to determine why people join the force and what it takes to keep them in a reserve component. Areas under study include demographics, effective ways for recruiters to make contacts, influences on the eligible population, and common perceptions of military life. One recruiter at the Denver conference suggested that the wives of male reservists should be surveyed, since they probably exercise more influence over their husband's career decisions than all other factors combined.

Also being analyzed is the positive propensity of various groups to enlist under different enlistment terms (see Figure 3) and the effect that a shorter training time upon entry might have on a potential reservist's thinking. In addition, research is ongoing in the area of non-prior-service versus prior-service personnel, the hope being that proper numbers of each can be directed into the appropriate component since each component requires a special mix of these categories.

Some of this marketing research is already bearing substantive results, but a bountiful harvest will take more time. In the meantime, what can the reserve community do? Perhaps more than they realize.

En route to the conference in Denver, this writer happened to speak with a fellow passenger who had only recently joined a reserve unit. When asked what he personally felt was the greatest problem faced by the reserve forces today, he responded, "A lack of chaplains."

As it turns out, the speaker was a Roman Catholic priest whose perspective may have enabled him to place his finger precisely on the pulse of the problem. As he noted, many young reservists only need someone, such as a chaplain, to encourage them and to reassure them. At the Denver conference, Colonel John Vilas made much the same point when he said that many young men and women drop out of the reserves when they get a bit discouraged, in part, because no one thought to ask them to stay.

"Some employees are not telling their employers that they are a member of the Guard or Reserve because they are afraid that it might jeopardize their advancement. There's a communication breakdown that needs immediate attention."

–Lt. Col. George Dumas, USA, speaking about the work of the National Committee for Employer Support of the Guard and Reserve

Larry J. Wilson

The Fourth Marine Aircraft Wing has established a very simple and effective system to deal with these unprogrammed losses. If someone decides to quit early, the local commanding officer himself must interview the disgruntled reservist. Since the Marine Reserve began this procedure, it has seen a remarkable upsurge in its retention of personnel, as witnessed by the fact that only they and the Air Force Reserve and Guard held their own in personnel strength in 1978.

Hard work ahead

Defense managers can do much to solve this problem. Officers and enlisted personnel alike can encourage eligible reservists to reenlist. Recruiters can use all of the bonuses and incentives, limited though they may be, at their disposal. And manpower planners must continue to bring the seriousness of the problem to the attention of the executive and legislative branches of government.

The Defense Department must strive to resolve its reserve problems one step at a time. As with many troublesome situations, however, the answer seems workable: creative management of available resources. The dedicated Federal and military managers who came together in Denver to compare their programs and problems took one more step in meeting this very real and immediate challenge. DMJ

VERT: A risk analysis tool for program management

By Major Greg A. Mann, USAF

So far, it has not taken a strong hold, but the Venture Analysis and Review Technique is proving its value for program managers who need to assess the risk of changes in cost, schedule, or specifications.

The weapons-system acquisition process has been subject to a great deal of criticism in the last decade. Poor forecasting has contributed to cost and schedule overruns which often affect our national defense capabilities and create adverse public opinion.[1] Faced with public and Congressional scrutiny, managers can no longer fall back on "cost growth" as an excuse for such overruns, and will be tasked more than ever to buy the best available system for the least possible cost within the prescribed time frame. For each program decision, the program manager must determine the best balance among three parameters: cost, schedule, and performance. In the weapons-system acquisition process, as contrasted with other areas of management, such determinations are more frequent and more complex, and are made with less of the essential information.[2] This is because of the inherent uncertainty involved in identifying and resolving the technological unknowns of developing programs.

Uncertainty creates risk,[3] but risk can be controlled to some extent by risk analysis. In particular, one recently developed quantitative risk-analysis method, the Venture Evaluation and Review Technique, is proving to be a powerful program-management tool and has been applied satisfactorily to several system-development programs.

Background

Studies of weapons-development projects indicate that most cost and time estimates made early in the acquisition cycle eventually prove to be lower than the actual cost and time for development. This cost growth and time delay can be attributed principally to two factors of the initial estimates.[4] First, the inability to accurately predict inflationary trends creates an inherent cost-estimating error. This error, however, tends to be small in relation to the second factor—requirements errors, which result from contractual changes in the scope of work. As a project develops, operational considerations and technical innovation necessitate changes in performance specifications, which in turn affect the schedule and cost. Such changes are most pronounced in a technically complex research and development project. A RAND Corporation study found that requirements uncertainty contributes as much as 30 percent to the variations in cost estimates.[5]

These technical-requirements errors, schedule overruns, and cost overruns, together with the rapid increase in the potential enemy's technical capability, influenced DoD's decision in 1970 to accomplish formal risk analysis as an integral part of the development process.[6] This directive raises a question: how is the program manager to implement formal risk analysis?

Risk analysis is not new. It has always been conducted to varying degrees, based on subjective judgment, experience, and qualitative inputs. Over the past 20 years, numerous risk-analysis techniques have been developed. However, most risk analyses are intuitive and incomplete: intuitive in that the structured quantitative approach often gives way to hunches and blackboard analysis; incomplete in that detailed analyses of isolated aspects of the problem are rarely integrated into a comprehensive analysis.

Because the three parameters of cost, time, and performance are highly interrelated, it is impossible to work with each factor independently without introducing errors.[7] But past techniques could not mathematically represent the three parameters and their interrelationships in a way that provided the program manager with accurate risk information on all three parameters simultaneously.

Furthermore, in the past, military procurement of major weapon systems often sacrificed the cost and schedule parameters in order to maintain prescribed performance requirements. In the 1960s attempts to alleviate the imbalance led to changes in procurement strategy. Today, top managers in the Air Force Systems Command consider cost to be as important as schedule and performance.

As this change in emphasis was evolving, decision-management techniques were also changing. The Critical Path Method and the Program Evaluation and Review Technique were developed in the late 1950s. These original networking techniques were useful in the basic managerial functions of planning, scheduling, and controling. They were also beneficial in laying out tasks and in making gross estimates for material, equipment, and manpower. However, both techniques assumed unrealistically that all activities would be completed successfully.

In the mid-1960s, the Graphical Evaluation and Review Technique was developed as the first computer-oriented networking methodology. From this evolved the Mathematical Network Analyser, developed by the U.S. Army. MATHNET provided the capability for events, activities, activity times, and cost to be modeled probabilistically.

This program was subsequently modified by Army Logistics Management Center personnel and renamed the Risk Information System and Cost Analysis. RISCA provides for the analysis of event uncertainty, but it does not evaluate the risk of failing to attain the performance

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[1] *Herbert L. Bevelhymer,* A Proposed Methodology for Weapon Systems Development Risk Analysis, *thesis, Wright-Patterson Air Force Base, Ohio: Air Force Institute of Technology, June 1973, p. 2.*

[2] *Ibid.*

[3] *For purposes of this article,* risk *will be defined as the "probability of not being able to acquire a weapon system of specified performance characteristics within an allotted time, under a given cost and by following a specific course of action." R.R. Lochry* et al., Final Report of the USAF Academy Risk Analysis Study Team, *Denver, Colorado: U.S. Air Force Academy, August 1971.*

[4] *Ibid.*

[5] *Fisher, G.H.,* A Discussion of Uncertainty in Cost Analysis, *The Rand Corporation, April 1962.*

[6] *Deputy Secretary of Defense Memorandum, May 28, 1970, subject: Policy Guidance on Major Weapon System Acquisition.*

[7] *Hamilton T. Lenox,* Risk Analysis, *thesis, Wright-Patterson Air Force Base, Ohio: Air Force Institute of Technology, June 1973, p. 71.*

objectives. Thus there was still a need to include the performance variables in the total risk-analysis methodology. This was accomplished in 1973 with the development of the Venture Evaluation and Review Technique. Since then, VERT has been used almost exclusively by Army program managers, who have accepted it as a flexible and valuable tool.[8]

The Venture Evaluation and Review Technique uses a network-simulation approach. In brief, this approach determines risk analysis through two steps. The first step entails constructing a graphic representation of the network—the ordered series of activities leading to specific events. The second step consists of analyzing that network using a computer program. The following example illustrates the process.

The F-X, a hypothetical fighter under development, has three major components: an airframe, an engine, and an avionics system. The desired course of action is to build each subsystem concurrently and integrate them later. A model of the essential features of this process as applied to the F-X is depicted in the Figure. The nodes (decision points) in the network represent alternatives which determine the next arc (activity) to be undertaken in the network. Additionally, the size of the problem has a bearing on how the network is structured. If the problem is large and complex, it is often advisable to construct lower level networks or subnetworks of major subsystems.[9]

Once developed, the network is converted to VERT program terminology. The program has a variety of input capabilities that make it possible for decision events and activities occurring in the network to be described. Numerical values for an activity's time, cost, and performance are assigned to each arc. At each node the next arc is determined by probabilities or by some criteria specified by a mathematical relationship.

The process involves a Monte Carlo simulation in which the design of a network flow across the entire network or subnetwork from the beginning to an appropriate end point leads to a trial solution of the problem being modeled. On the F-X fighter, for example, simulation could assess the activity flow across the total development program, or could focus on the flow across the wing-development subnetwork.

The process is repeated as many times as requested by the user in order to create a large sample of possible outcomes. Slack time, completion time, cost, and performance results are generated as output data for each node. A relative frequency distribution depicts the range and concentration of values observed at a given node. Also, the probability of exceeding certain value levels can be obtained from the cumulative frequency distributions, and confidence levels can be inferred.

The computer program produces pictorial histogram approximations for selected nodes. Thus, a program manager would have an integrated risk analysis for a particular point of interest in his program. For example, the analysis of the cost, schedule, and performance risk for the F-X program with respect to meeting the scheduled Defense Systems Acquisition Review Council milestones could be expressed in the following manner.

Schedule Risk. The probability or confidence level of being within eight weeks of the scheduled DSARC is 90 percent; the probability of a schedule overrun of 20 weeks or more is 5 percent.

Cost Risk. The total cost of the program will be within $100 million of the target cost, with a 90 percent confidence level; there is only a 5 percent probability of a cost overrun exceeding $225 million.

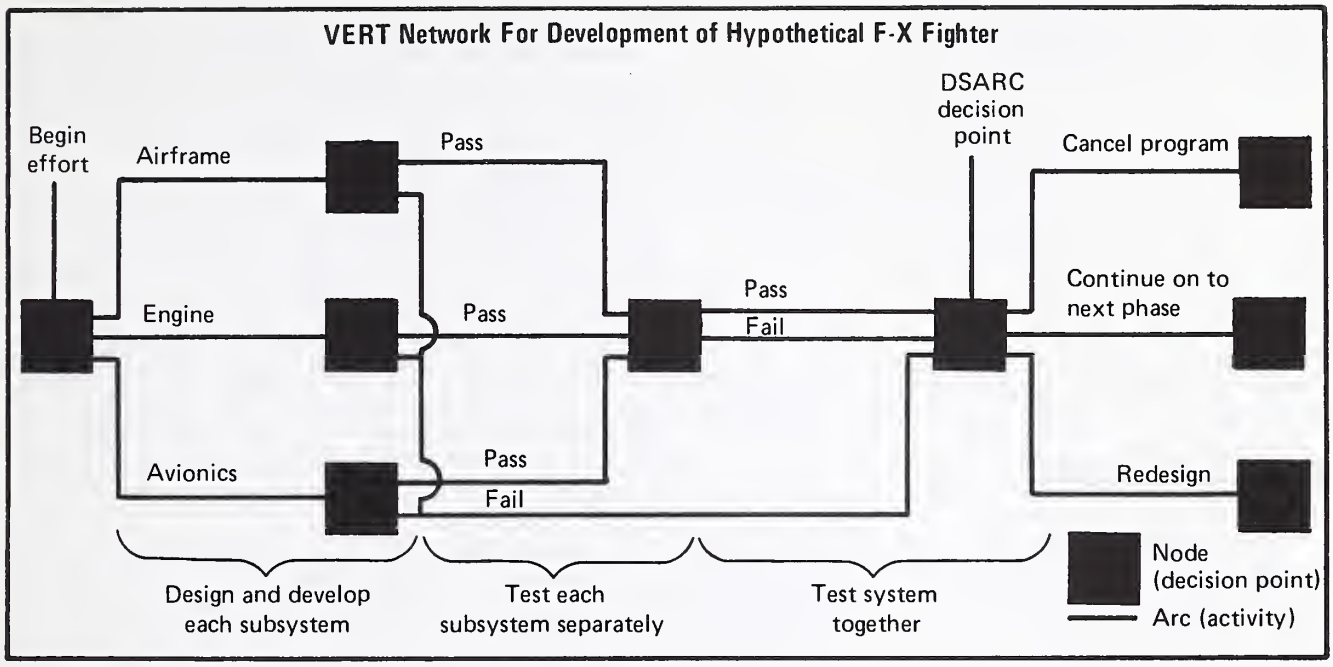
Performance Risk. The confidence level of being within 500 pounds of the static sea-level thrust specifications is 90 percent; performance risk could be indexed to other specifications such as speed, weight, reliability, and maintainability.

The conclusions of the above analysis could vary as key input parameters change. By modifying the values of the input data, one can easily rerun the model. This sensitivity-analysis capability provides the decision maker with the answers to many hypothetical questions. For example, what if the delivery of critical avionics components on the F-X were to take three weeks longer than originally expected? This contingency could be evaluated quickly. By substituting the "what if" data and rerunning the simulation, the decision maker is provided with new information. Although the program manager is the ultimate user of the VERT analysis, the majority of simulations have been developed and run by the systems analysis or program control offices supporting the manager. Yet VERT is not a difficult risk-analysis technique requiring the services of a computer programmer or systems analyst. All that is needed is an individual who is familiar with basic mathematics and computer programming and who can devote about a week of continuous study and effort to master the model's capabilities.[10] However, such proficiency would be required only in simulating the most complex or unusual risk situations. The extent to which a project needs to be segmented into activities and events is a function of the available data and the results desired. Breaking down complex situations into subnetworks simplifies the programming greatly. Some managers

[8] *T.N. Thomas,* VERT: A Risk Analysis Technique for Program Managers, *Defense Systems Management College, May 1977, p. 21.*

[9] *Gerald Moeller,* VERT Documentation, *Rock Island, Illinois: U.S. Army Armament Command, 1976. Moeller developed VERT in 1973.*

[10] *Ibid, p. 4.*



prefer to estimate parameters for the smaller elemental items rather than for the entire system or for higher-level work packages.

If the results achieved in the analysis are not satisfactory, the program manager must analyze the situation and come up with results that agree with his subjective judgment. When the proper relationships are determinable and mathematically tractable, most analysts and decision makers prefer the quantitative approach.[11] In the VERT network-analyzer program, emphasis must be placed on establishing proper relationships. Actual conditions must be represented if creditable analytical results are to be produced. The desire for a quantitative answer or analysis should not force the analyst to disregard or alter critical relationships or facts. The analyst must recognize not only his own limitations but those of VERT as well.

Program applications

The Venture Evaluation and Review Technique has been used in support of several Army programs and at least one Navy project. One of the most noteworthy applications of VERT occurred during the 1975 demonstration and validation phase of the Army's XM-1 Tank development program. The study was structured to examine the XM-1 program manager's question: given a decision to proceed into full-scale engineering development, what is the risk of experiencing unfavorable schedule, cost, or system performance variances? The study was refined to address the following specific objectives:

- Schedule risk expressed as a time distribution for meeting the Army System Acquisition Review Council milestone.
- Cost risk expressed as cost-variance distributions derived from schedule analysis.
- Performance risk expressed as the probability of experiencing a hardware problem that would significantly delay completion of the test program.

VERT simulation was also used in the Cannon-Launched Guided Projectile program to examine the probability that the development effort would successfully reach the production phase. The simulation indicated that there was a 95 percent probability of at least one manufacturer qualifying for full production. It also indicated that the total cost of the program would run about $9 million over baseline cost if there were a 9-month extension in the schedule.[12]

The technique has also been used in support of the Army's Platoon Early Warning System, the M110E1 self-propelled howitzer, and the Advanced Attack Helicopter program. On the helicopter program, VERT was used to evaluate the validation-phase schedules through the second Defense Systems Acquisition Review Council milestone. At this early stage of development there was considerable risk in many areas. The analysis allowed early identification of possible impacts caused by activities having high probabilities of not occurring as planned. The benefits were so great that the program manager requested continuous tracking of the program by VERT simulation.

To explore the capabilities of the risk-assessment technique, the Navy ran a test application of VERT on the radar system for the F-18 aircraft. The risks were related to new performance requirements, and the simulation examined the amount of testing to be conducted in the laboratory versus aboard a flight-test aircraft. Again, the

[11] *Lenox, p. 72.*

[12] *James B. Besson, Risk Analysis of the 155MM Cannon-Launched Guided Projectile, Rock Island, Illinois: U.S. Army Armament Command, 1976, p. 4.*

analysis provided the program manager with valuable information.

Problems with VERT

Some minor problems have arisen with VERT, but none are considered major obstacles to its effective use. The most frequent problem is related to the collection of data needed to describe the probabilistic behavior of the variables of time, cost, and performance. Although the VERT program is capable of using many different distributions, most data are represented by a triangular distribution indicating, for example, most pessimistic, most likely, and most optimistic. This is not necessarily wrong, but it does not really use the capabilities of the model, and it thus reduces the accuracy of the simulation output.[13]

Another common data problem is the inability to obtain from the experts accurate estimates of the time and cost. The experts tend to be overly optimistic in their estimates, but this problem is waning as they are coming to realize that the data are being used only for a risk-analysis simulation and will not cause them embarrassment by appearing in other documents.

More can be done

Although VERT appears to be quite promising and devoid of major problems, it has not enjoyed wide use. One reason for this lies not with VERT, but with the inadequate understanding of risk-analysis concepts in general.[14] Many program managers are handicapped by a lack of familiarity with quantitative risk-assessment techniques, and few people in the military services are experienced enough to perform the analysis. In Air Force acquisition programs, for example, such techniques have not been used. Similarly, few managers are accustomed to using the outputs of a risk analysis. For instance, probability distributions depict the risk of development more accurately than do point estimates; yet there is widespread resistance to probability distributions because of their unfamiliarity.[15]

Consequently, an education program is needed to instruct analysts and managers in the preparation and use of formal, quantitative risk analysis. The program needs to be designed to emphasize risk analysis for high-level officials who deal with uncertainties in program management and program approval.

Another reason that VERT is not used often is the systems-acquisition community's failure to publicize or offer significant training in VERT. Consequently, program-management personnel are unaware of the technique and its possible applications in the program-development environment. The Army recognized this shortfall and started a comprehensive course of instruction on risk-analysis techniques, primarily oriented toward the RISCA methodology. Now, because of increasing interest and confidence in VERT, the Army Logistics Management Center intends to emphasize it in advanced risk-analysis courses.

Yet another reason VERT is not used more frequently is the problem of limited numbers of personnel and a high rate of personnel turnover in program offices. No agency outside the program office can effectively perform a risk analysis of that program, since only the program office has the necessary data to work with the program manager and has access to him in selecting alternative courses of action. Thus, a risk-analysis team is needed at the product-division staff level to provide the corporate memory necessary to implement a quantitative risk analysis. This team would marry the mechanics of VERT with the data source in the program office.

As the use of VERT increases, knowledge of its applications will grow. Further applications and research are necessary to confirm its validity as a risk-assessment technique. Users need to be encouraged to express their reactions to the technique. These reactions should be analyzed to ascertain the actual benefits being achieved. This investigation could lead to the development of a data bank to determine the degree to which actual program events were substantiated by the model's predictions.

The Venture Evaluation and Review Technique is not necessarily better than any other technique, but it does provide the program manager an accessible tool for integrating cost, schedule, and performance parameters. With VERT, the program manager can add a new dimension to the analysis of program decisions, improving the perspective on alternative courses of action. DMJ

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[13] *Thomas, p. 17.*
[14] *Lochry, p. 107.*
[15] *Ibid.*

GAO report takes a close look at Defense manpower managers

Summarized by Assistant Editor Carolee B. Hartman

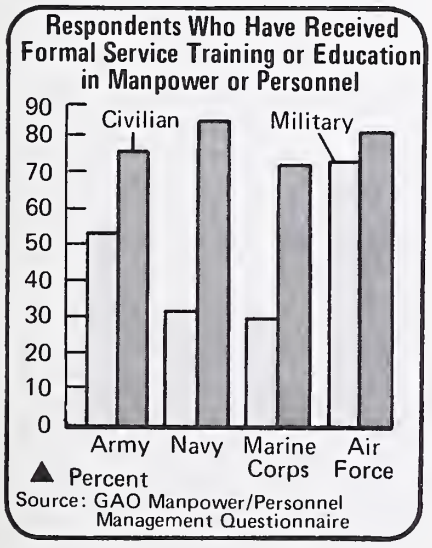
This report synopsis is the first in a series. In succeeding issues, the* DMJ *editors will highlight significant reports from the Rand Corporation, the Navy Personnel Research and Development Center, the General Accounting Office, and others. Our goal is to inform you of various research projects and studies that you may not otherwise be aware of. As always, the* DMJ *is interested in your comments and criticisms.

A number of manpower managers feel that the time they are spending in their positions will not advance their careers. This is just one of the many findings of a recent General Accounting Office study recommending ways to improve career opportunities in manpower and personnel management in the military services.[1] The recommendations, which were based on research that included interviews, a review of earlier reports, and results of the questionnaire, were made to Secretary of Defense Harold Brown.

The detailed questionnaire was sent to over 4,000 military officers and civilians working in manpower and personnel management positions at their service's headquarters, personnel centers, and command posts. A sizable amount, 3,620, of the survey group responded, providing information about their backgrounds and jobs and about their attitudes toward the career-development practices of the service employing them.

The study divides the survey population into two groups: military and civilian. Some significant differences were pointed up between the two groups, particularly the fact that military employees generally receive less formal training in manpower and personnel management careers and devote a smaller portion of their entire tour of duty to those career fields.

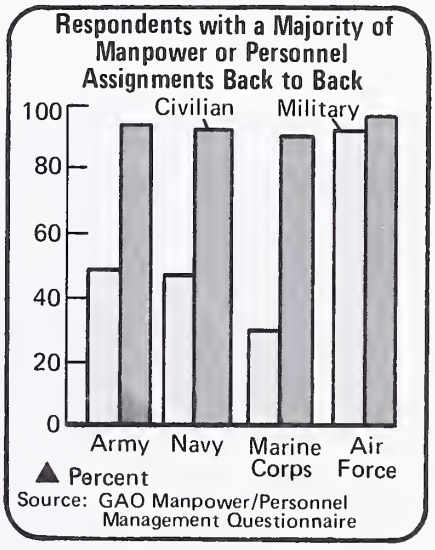
In contrast to the situation in the military service, personnel management is a more stable career field for DoD civilians, who receive more in-service training and have more years of experience in the field than do military personnel managers. For example, the questionnaire data indicate that the civilians had served about twice as long in their current jobs as the military officers had. Civilians also receive more personnel assignments than do military officers—roughly eight assignments for the civilians in contrast to between one and three assignments for officers in all services except the Air Force.



For the DoD civilian whose field is personnel management, then, the career picture is rosier than it is for the military manager in the same field; nevertheless, the report states, occupational conditions for both the civilian and the military staffer could be improved. Such improvements would naturally benefit the organization, according to the report, but would also benefit individual managers, who are key elements in the success of the all-volunteer force, total-force management, and the Civil Service Reform Act.

In the military, the report finds, problems exist even though the services have recognized the need for expertise in manpower and personnel management. Military managers are often impeded not only by a lack of formal training in the field, but also by assignment and rotation practices that foster a variety of short tours. As a result, military managers are usually generalists, rather than manpower careerists with long-term practice in the field. Moreover, some services do not have career specialties in manpower and personnel management, and none of the services has clearly defined professional standards for the field.

Thus, current career management practices hinder specialization and sometimes prevent officers assigned to the personnel field from doing their jobs as effectively as they could. This situation exists because the military traditionally has valued combat operations and command positions as the best routes for career advancement. Military



[1] *For purposes of the study, GAO separated "manpower" managers from "personnel" managers, the former dealing with requirements, the latter with recruitment and training, but in this summary the two terms are often combined. The 158-page report, generated by the GAO's Federal Personnel and Compensation Division, is titled* Military and Civilian Managers of Defense Manpower: Improvements Possible in Their Experience, Training, and Rewards. *Single copies are available free of charge from the U.S. General Accounting Office, Distribution Section, Room 1518, 441 G Street, N.W., Washington, DC 20548. Give the report number and date: FPCD–79–1 (Volume I) and FPCD–79–1A (Volume II: Related Appendixes), February 16, 1979.*

questionnaire respondents who had advanced the fastest had, on the whole, spent the least time in manpower and personnel positions. Promotions generally came more slowly to officers who dwelled in these positions.

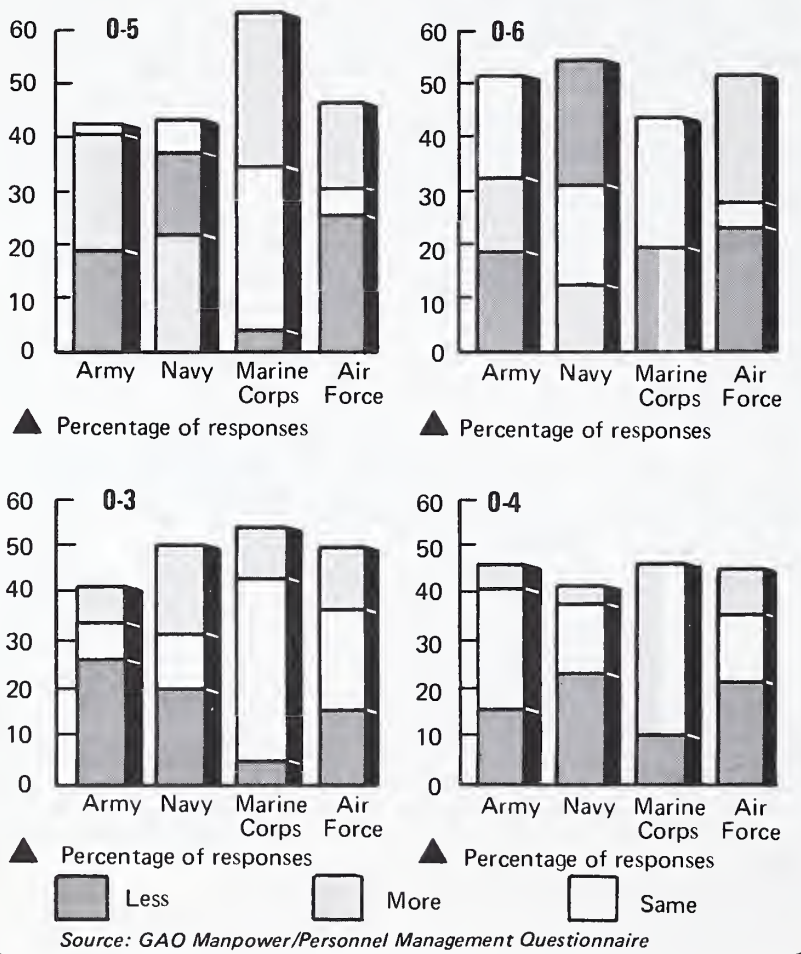
Of all the services, the Air Force looks most favorably on practices conducive to improving individual performance, such as consecutive job assignments in the same occupational field. For example, 90 percent of the Air Force officers responded that the majority of their assignments in manpower and personnel had been consecutive, compared to about 50 percent of the Army and Navy respondents and 30 percent of Marine Corps respondents. Air Force managers also had received, on the average, twice the inservice training as other service respondents.

Inadequacies on the civilian side, the study points out, often differ from those on the military side. Civilian careers, for example, are more likely to be hindered by lack of mobility. Perhaps more importantly, civilian managers do not assess their jobs, their organizations, or their opportunities as favorably as do the military officers. Such perceptions obviously can have a negative effect on job performance.

The study further concludes that the services should put more emphasis on individual career management for civilians, in order to overcome the misconception that employment of well-qualified civilian careerists can be accomplished by outside hiring. The report points out that three-fourths of future DoD civilian managers and executives are already on board.

Are Manpower and Personnel Career Enhancing?

Judging by returns from military managers who responded, it varies extensively from grade to grade and between services.



Source: GAO Manpower/Personnel Management Questionnaire

Armed with data from its own questionnaire and from earlier studies, the GAO report makes several recommendations that would help DoD focus on careers in the manpower area. Some recommendations are listed in the sections specifically identified for that purpose, while other related suggestions are implied throughout. The report specifically recommends, for instance, that the Secretary of Defense ensure that the services develop both manpower and personnel management career fields. The career fields should be founded on established standards of background, education, training, experience, and tenure for all manpower and personnel management positions. In addition, the services should specify certain manpower and personnel experience as the equivalent of command and operational experience and should instruct promotion boards to consider it accordingly.

On the civilian side, the report recommends that career programs balance rewards to individuals and to organizations by recognizing that individual development and career progression are important management tools. Increased emphasis on career patterns, the report suggests, may encourage such favorable results as the current Air Force program to create a personnel/manpower career group, supported by formal courses in the field and administered by a central career-program office. The Army already has civilian occupational fields in manpower management.

Significantly, the GAO report confirms that the Office of the Secretary of Defense accepts its responsibility for improving the career programs of DoD manpower and personnel managers. The report's recommendations to the Secretary of Defense are in large part predicated on the belief that in any occupation, professional standards and the means of achieving them should be clearly defined, and that when these standards are not identified, job performance and accountability suffer. A volunteer military force, serving in a peacetime era as a deterrent to war, must be well managed, and will not be so without a commitment to professionalism by individual managers, as well as by those whose policies enable managers to excel. DMJ

Air Force Offers Guidance to PMs

The Air Force Program Management Assistance Group recently cited five initiatives a program manager can take to avoid some of the pitfalls commonly associated with program management. These are:

- Ensure that integrated logistics support planning occurs early in the development cycle. This includes the formulation of maintenance and operational concepts and the definitive guidance on the nature and scope of support for the system.
- Ensure that only accurate and complete information about the program is circulated. To minimize the spread of distorted or misleading information, the program manager should provide clear and frequent communication with all the activities and personnel connected with the program. The program manager should create a single, official source for program-related information.
- Plan early to use government-furnished equipment. Allow for the time and manpower needed for source selection and negotiation to verify availability of the equipment. Remember that government-furnished equipment may be serviceable when it leaves the depot but may fail to pass the inspection of the contractor and that it may arrive in a slightly different configuration than was expected. Also, make sure the responsibility for managing the equipment is clearly assigned.
- Be prepared to adjust to and accommodate changes to the contract. Program offices are often unprepared to manage changes to the contract despite the well-planned manner in which the basic contract was formulated and awarded. Although the Configuration Control Board plays a major role in the change process, the program manager must devote sufficient attention to the events preceding and following the Board's deliberations and response as necessary.
- Communicate effectively with your staff and with the contractor. Ensure that everyone is working toward the same goal. Sharpen your reading, writing, speaking, and listening skills. Open communication is something the program manager must instill and nurture.

Hughes Aircraft Cited For Cost Reduction

The Army Electronics Research and Development Command (ERADCOM) has awarded Hughes Aircraft Co. $850,000 for the company's success in designing a mortar-locating radar. Hughes participated in a Design to Unit Production Cost Program that included the award fee provision as an incentive to developing innovative management and engineering techniques resulting in reduced costs.

The design-to-unit production cost contract provided for an $850,000 award to be paid in four increments if the contractor could reduce hardware costs while still meeting the performance requirement. Based on an intensive Army evaluation, the contractor received portions of the award in 1975 and 1977. Recently, Major General Charles D. Daniel, Jr., ERADCOM commanding general, presented the remainder of the award.

ERADCOM's Award Fee Evaluation Board determined that the actual full-scale production unit cost for the 116 systems ordered was $526 thousand, substantially below the 1973 unit production cost estimate of $575 thousand.

Personnel Data Brought Under One Roof

The responsibility for maintaining and monitoring reserve-component personnel data has been transferred from the Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics to the Defense Manpower Data Center. The move, which consolidates all manpower-related computer activities under one roof, involves the transfer of some 1,700,000 personnel records summarizing the skills and numerical strength of reserve-component personnel.

The principals at the transfer-of-function ceremony were Harold W. Chase, the Deputy Assistant Secretary for Reserve Affairs, and Ken Scheflen, the Director of the Defense Manpower Data Center.

Sergeant Major William A. Connelly

New Sergeant Major of the Army Named

The Army has selected William A. Connelly to be the new Sergeant Major of the Army. The appointment becomes effective July 1, when the current Sergeant Major of the Army, William G. Bainbridge, retires.

Currently serving as Command Sergeant Major of the U.S. Forces Command, Fort McPherson, Georgia, the 47-year-old Connelly was selected from a field of 77 command sergeant majors being considered for the position. During his 25-year Army career, the heavily decorated Connelly had tours in Germany and Vietnam. He will be the sixth Sergeant Major of the Army, a position created in 1966.

OSD Releases List of Top Contractors

The Office of the Secretary of Defense has released an index of 100 companies which, along with their subsidiaries, received the largest dollar volume of military prime-contract awards in fiscal year 1978. The top twenty on the list are—

General Dynamics
McDonnell Douglas
United Technologies
Lockheed
General Electric
Litton Industries
Boeing
Hughes Aircraft
Raytheon
Grumman Corporation
Rockwell International
Textron
Chrysler
Sperry Rand
Northrop
RCA Corporation
Honeywell
Westinghouse Electric
Martin Marietta
Fairchild Industries

New Navy Film Aimed at Vendor Personnel

A new film designed to inform vendor personnel of the importance of the specific product or component they work on is now available through the Navy Sea Systems Command's Material Assessment Office.

Entitled "It's Your Navy," the film helps vendor personnel understand the on-ship location and function of the product. One portion of it highlights the problems caused by the installation of defective or non-conforming material. Another portion gives the viewer an idea of what it is like to be aboard ship under combat or severe environmental conditions.

For more information about obtaining and using the film write: NAVSEA Material Quality Assessment Office, Portsmouth Naval Shipyard, Portsmouth, NH 03801.

Army Recruiting Figures Take Slight Upturn

The Army recruited 1,500 more persons in the first three months of calendar year 1978 than it did in the same time frame last year. Despite this increase, though, the 33,600 men and women who were recruited in January through March represent only 94 percent of the Army's increased recruiting goal for that period.

The shortfall is partly attributable to the continuing difficulty in recruiting women. From January through March, the Army met only 60 percent of its recruiting objective for non-prior service women, a shortfall of roughly 2,000 women. It should be noted, however, that recently announced changes in enlistment standards for women were not applicable during this period.

Event	Date	Place	Contact
Computers in Communications	Jun 25-26	Los Angeles, CA	AIAA P.O. Box 91295 Los Angeles, CA 90009 (213) 670-2973
Managing Engineers	Jun 28-29	Washington, DC	
	Jul 26-27	Boston, MA	
	Aug 20-21	Dallas, TX	
Fundamentals of Modern Personnel Management	Jun 25-29	Chicago, IL	American Management Associations 135 West 50th Street New York, NY 10020 (212) 586-8100
	Jul 9-13	Denver, CO	
Fundamentals of Data Processing for the Non-Data Processing Executive	Jul 9-11	Los Angeles, CA	
	Jul 16-18	New York, NY	
	Jul 23-25	Atlanta, GA	
	Aug 7-9	Chicago, IL	
The Supervisor as Trainer	Jun 25-27	Washington, DC	Graduate School, USDA 277 National Press Bldg. 529 14th Street, N.W. Washington, DC 20045 (202) 447-7945
Briefing and Presentation Techniques	Aug 20-22	Washington, DC	
Subcontract Management & Advanced Purchasing Techniques	Jul 9-13	Los Angeles, CA	American Graduate University/ Procurement Associates, Inc. 733 North Dodsworth Ave. Covina, CA 91724 (213) 966-4576
Management of Programs & Projects	Jul 11-13	Washington, DC	Continuing Engineering Education George Washington University Washington, DC 20052 (800) 424-9773
Source Evaluation & Selection Process	Jul 16-17	Boston, MA	TMSA P.O. Box 91295 Los Angeles, CA 90009 (213) 670-2973
OMB A-109 & Mission Analysis	July 23-24	Los Angeles, CA	
Successful Middle Management	Aug 8-10	Denver, CO	Practical Management Associates 6910 Owensmouth Avenue Canoga Park, CA 91303 (213) 348-9101
	Aug 15-17	San Francisco, CA	
Fourteenth Annual Symposium	Aug 14-16	Clearwater Beach, FL	Society of Logistic Engineers 303 Williams Avenue Suite 922 Huntsville, AL 35801 (205) 539-3800

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